THE
METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

Vol. 27 NEW YORK, MAY, 1929 No. 5

Duralumin Airship Construction

A Large Job, Using Metals in an Airship

By O. H. BARNHILL
Pasadena, California

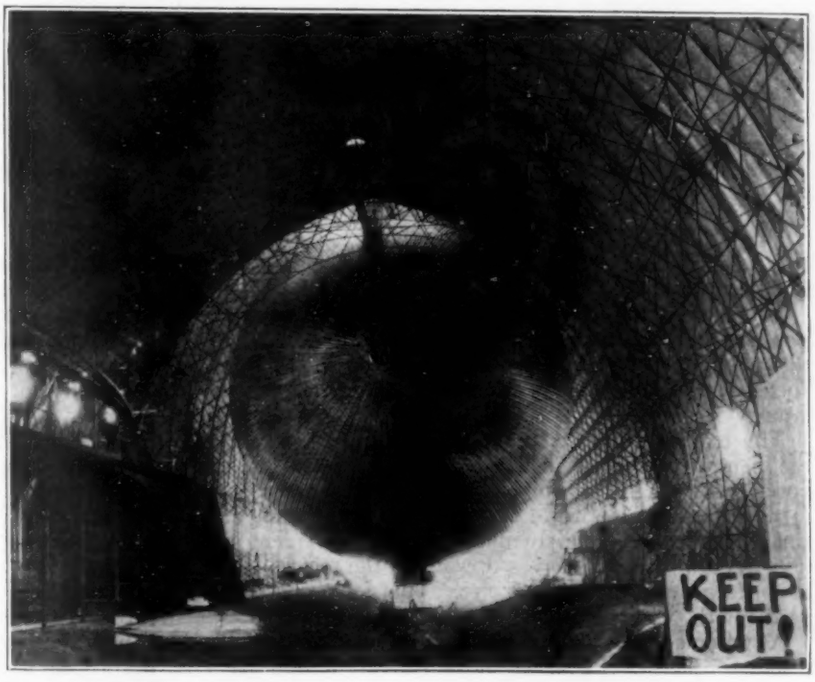
WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

BUILDING the "City of Glendale," Duralumin airship driven by steam, recently completed at Glendale, California by the Slate Aircraft Corporation, presented many difficult problems in sheet-metal construction. Not only is it one of the largest jobs of the kind undertaken, but it differs radically from any other. All the inventor had to go by was an intangible idea, there being no precedents or patterns to follow. Yet the completed vessel is a splendid example of all-metal construction and perfect workmanship.

The ship is 212 feet long and 58 feet in diameter at its greatest girth, containing 330,000 cubic feet. The cabin underneath is 80 feet long and holds 40 passengers, in addition to the power plant and operators' quarters. The cost of the vessel was $120,000, although it could be duplicated for $75,000.

This gigantic undertaking was not carried to successful completion without numerous mistakes and much cutting and trying. Nothing like this strange craft had ever before been built. Even many of the tools used had to be designed and manufactured. Many mathematical and chemical calculations had to be made with great exactitude and correctness, while difficult engineering problems had to be solved and much careful planning executed.

The gas bag or hull is of peculiar shape, being pointed at both ends, but much larger at the forward end and sloping gradually to the rear extremity, where it comes to a sharp point. The lines were modelled something



Front End, "City of Glendale." Working Model Is Shown in Left Foreground. On Extreme Left Is Shown a Corrugating Form

like those of a whale, or largeheaded fish, because they were best suited to the type of propulsion used. Instead of pushing the hull against the air, the air is cleared away in front of it and delivered upon its rear slope, forcing it forward into the partial vacuum or area of negative pressure ahead.

The duralumin was received in rolls 18 inches wide. It was first cut into lengths to form the main part of the hull, the end sections being shaped separately. After trimming to the proper shape with a specially designed metal saw, the metal strips were strengthened with corrugations. These gutters are 1½ inches deep and there are two of them in each strip at the widest place, where the ship's girth is greatest.

The corrugations become narrower as they approach the ends, the number decreasing as one by one they are pinched out, but their depth does not vary. The constant depth of the gutters simplified their making, although their varying width and the curve of each strip presented difficult problems. Furthermore, the metal had to be tightly stretched while being formed, else it would not keep its shape.

Wooden forms were fashioned, with gutters corresponding in shape exactly to the corrugations desired in the metal fabric. The latter was pressed into the wooden forms with iron pipes by running metal wheels over the latter.

The main form rests upon a platform at one side of the hangar, about 15 feet above the floor. It is composed of 4 x 4-inch fir blocks running crosswise and fastened to a frame made of angle iron and resting upon small wheels, to facilitate moving into convenient position when in use. It curves upward in the middle exactly in conformity to the ship's curve. This form and the two used for the end pieces cost $4,000.

A trimmed sheet of duralumin is wound around a wooden roller, from which it is reeled off and passed through a lacquer bath. As it emerges from the latter and passes over a roller the surplus liquid is brushed off by hand.

The fabric is then laid upon the form and tightly stretched by turning metal rollers, around which each end of the strip passes. The rollers are turned with handbars, which fit into holes in the rollers.

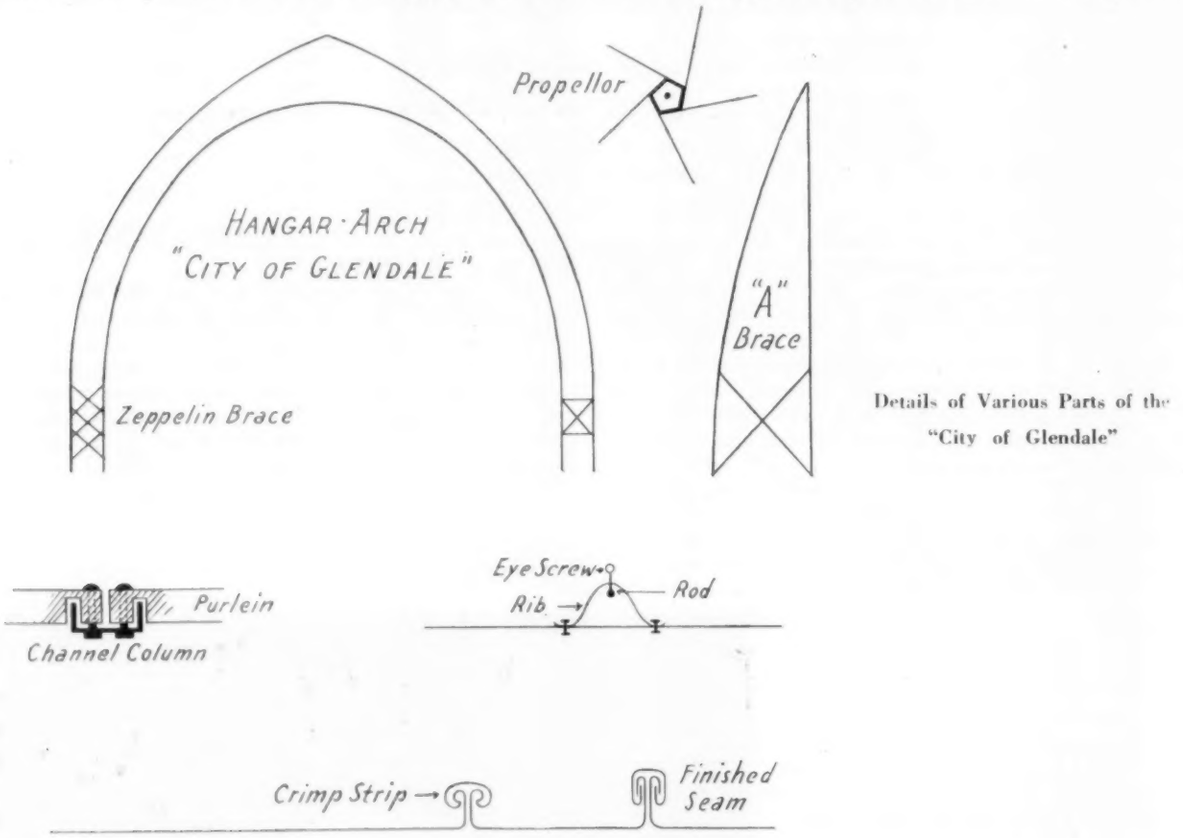
Metal wheels with hollowed rims run over the pipes which press the fabric into the gutters of the wooden form. These wheels are not anchored to the journal upon which they turn, but are allowed to move laterally to accommodate their position to the varying width of the gutters beneath.

The wheels are held in a frame which has other wheels running underneath the frame which supports the wooden form. This makes it possible to apply downward pressure upon the fabric being corrugated, the pressure being regulated with set screws. The wheel carriage is pulled from one end of the duralumin strip to the other with a steel cable.

The corrugated strips next have their edges turned upward and inward a three-quarter round to hold the crimp strip which fastens the edges together. The crimp strip is three-quarters of an inch wide and is run through a crimper which gives the edges a three-quarter inward turn.

When the edges of the corrugated strips are brought together the crimp strip is snapped over them and its sides pressed together by drawing it between two rollers of a small hand machine. Lacquer is then run into this gas-tight joint. The two edges of the strips project outward about one-half inch, being pressed flat together.

In forming the hull, the corrugated duralumin strips are laid into a rope cradle and fastened together. The cradle is formed of quarter-inch hemp ropes which pass through small pulleys fastened to the framework of the hanger half-way up one side. Weights at one end of the ropes balance the downward pull of the growing hull.



Details of Various Parts of the "City of Glendale"

As the metal strips are fastened together on the platform at one side of the hangar they are allowed to slide down into the rope cradle and pushed up on the other side, as the width of the fabricated section increases. When the latter rises beyond the half-way point and is in danger of caving in, it is upheld with ropes fastened to wooden clamps. The latter are screwed onto the outward-projecting seams, which are made thick at the edge by the crimp strip.

The ribs are made of 2½-inch strips of duralumin bent to form a gutter ⅝ inch deep, with the edges turned back for riveting. The ribs are spaced 19 inches apart inside the hull, running at right angles to the latter's axis. They are riveted on either side on each side of the seams in the hull and on either side of the latter's corrugations.

Putting the Last Corrugated Sheet on the Hull of the "City of Glendale." A Close View of a Corrugating Form Shown in Left Foreground

Punches and rivet-setters work with small hand levers and are attached to one end of U-shaped clamps. The latter are cast from scrap duralumin and are of varying sizes, because the width of the strips to be fastened together varies and some clamps have to reach farther over the edge than others.

The cabin is attached to the lower side of the hull and supported by small steel cables inside the hull with eye screws. The latter screw into quarter-inch rods three inches long placed inside the ribs where the latter cross the seams and are double-riveted. These cables pass entirely around the hull on the inside, the main support being at the top.

In addition to the hand-made tools mentioned, the following machines are used:

Le Blond heavy-duty lathe, 21-inch; Wallace wood lathe; Champion drill, 20-inch; Artizan lathe, 10-inch, drill, vise and emery wheel combined; Cornice Brake 10-foot double-truss cutter; Marvel down-cut metal saw; The Linde welder; Prest o' Lite Oxweld.

All machines are run by electric power from overhead shafting.

The hydrogen gas manufacturing plant is located inside the hangar, in an enclosed sheet-metal shop. Natural gas is burned inside a vertical metal tank 4 x 8 feet, insulated with one inch of asbestos. The inside of the tank is honeycombed with brick and lined with fire-brick. A small blower forces air into the tank, supplying oxygen. When the desired heat is obtained the air is shut off, extinguishing the fire.

This "cracks out" the carbon, which in another and smaller tank is washed out with a water spray. A third tank contains ice for cooling the gas and condensing the moisture which it contains. The hydrogen is then filtered through a cloth bag in a storage tank 7 x 8 feet, from which it is piped into the airship.

The temperature of the cracking tank is ascertained by a pyrometer actuated by a hot and cold wire, which generate an electric current when connected at their outer ends. One of them leads inside the fire tank, while the other remains outside in the cold. At test showed 1,030 degrees Fahrenheit and 28 millibolts.

Hydrogen gas 85 per cent pure is obtained by this process. Hydrogen for future ships is to be separated from water by the electrolytic process, which produces hydrogen 98 per cent pure. The remaining oxygen will be sold as a by-product.

Corrosion of Brass

Q.—We are considering the advisability of using brass bolts and nuts in conjunction with galvanized bands with which we attach galvanized wire fence fabric to galvanized steel fence posts. We understand, however, that brass bolts and nuts used with these galvanized materials would oxidize.

Is this so, and is there any reading matter or pamphlet you know of which treats on this particular subject?

A.—Brass bolts and nuts used in contact with galvanized iron will tarnish but will actually corrode less than would be the case if the brass were separately exposed to outdoor atmospheric conditions. The zinc coating, on the other hand, will corrode much more rapidly because of its contact with the brass and the same is true of the iron or steel beneath the galvanized coating. It would seem unwise to use brass bolts and nuts in this connection because of their tendency to cause the destruction of both the galvanizing and the steel more quickly than would otherwise be the case.

I don't know of any pamphlet or article which deals with this specific subject. The general subject of atmospheric corrosion is well covered in the book "Corrosion: Causes and Prevention," by Frank N. Speller, published by the McGraw-Hill Book Co., Inc.

—Harry M. St. John.

Metal Men Among the Officials and Committee Workers of the American Foundrymen's Association

Fred Erb
President

N. K. B. Patch
Vice-President

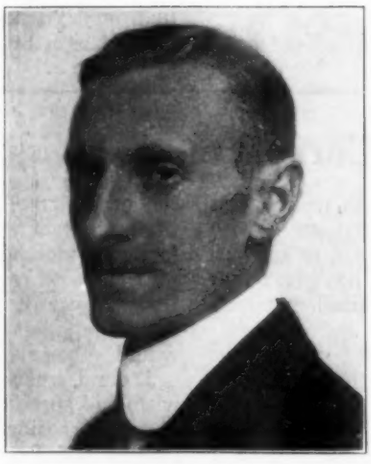
C. E. Hoyt
Secretary-Treasurer

S. T. Johnston
Director

L. W. Olson
Director

D. H. Wray
Director

J. W. Bolton
Chairman, Non-Ferrous Division



F. L. Wolf
A. F. A. Representative to Testing Materials Society

A. A. Grubb
Chairman, Committee on Sand Grading

Foundrymen's Association Meeting

Brass Casting Methods and Costs Discussed in Several Sessions in Chicago, Ill., April 8-11, 1929

By H. M. ST. JOHN
Metallurgical Editor

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

THE 33rd annual convention of the American Foundrymen's Association, held at the Hotel Stevens, in Chicago, during the week of April 8th, was somewhat unlike any previous meeting of this organization. It should be rated as a highly successful forward step in the development which has been taking place during the past several years in the annual conventions and exhibitions of the Association.

In the past, large exhibitions located in buildings which could not provide accommodations for technical meetings have caused inconvenience to those who wished to attend both exhibition and meetings. At times it has been necessary to travel several miles in going from one to the other. Two years ago, at the Chicago meeting, there was no exhibit of any kind. This resulted in undivided attention to the meetings and it was noted that the discussion of papers was unusually complete and valuable. However, the total attendance was less than half that usually attracted by these meetings. This year a limited exhibition was held, patronized by some 150 exhibitors. Both the exhibit and all of the meetings were housed in the Stevens Hotel, so that there was a maximum convenience of access from one to the other. As a result the exhibit was well attended and, at the same time, the meetings were of unusual excellence, at least as valuable as at the Chicago convention of 1927. The total registration was well over 3,000, about three times the number registered at Chicago in 1927.

The exhibition floor space was about 25 per cent of that used in Philadelphia in 1928, or in Detroit in 1926, but the number of exhibitors was about 60 per cent of those participating in the above exhibits. The exhibitors showed considerable ingenuity in taking full advantage of the space allotted to them and the displays were probably quite as interesting and instructive as has usually been the case.

New officers elected at the annual meeting, to serve during the coming year, were: President, Fred Erb of Detroit; Vice-President, N. K. B. Patch of Buffalo; Directors (to serve three years), H. S. Falk of Milwaukee, S. T. Johnston of Chicago, F. J. Lanahan of Pittsburgh, D. H. Wray of Rochester and Arnold Lenz of Saginaw, Mich.

Prizes were awarded as follows for the best papers presented at the 1928 convention in Philadelphia:

"Reducing New Sand Consumption in a Steel Foundry," by H. A. Mason, of the Gould Coupler Company, Depew, N. Y.

Temperature Measurements of Molten Cast Iron," by W. F. Roeser and H. T. Wensel, of the Bureau of Standards, Washington, D. C.

"The Effect of Lead on the Properties of a Complex Brass," by O. W. Ellis, at that time with Westinghouse Electric & Manufacturing Company of Pittsburgh, now with the Ontario Research Foundation at Toronto.

Winners of the apprentice contests were the following:

Patterns: First prize, H. Smith, Milwaukee Pattern & Manufacturing Company, Milwaukee; second, V. Tatterwossian, Brown and Sharpe Manufacturing Company, Providence, R. I.; third, S. Morotto, Fletcher Manufacturing Company, Philadelphia.

Steel Moulding: First prize, G. Warnek, Sivyer Steel Casting Company, Milwaukee; second, H. Poepke, Falk Corporation, Milwaukee; third, M. Gadzala, Hubbard Steel Foundry Co., East Chicago, Ind.

Iron Moulding: First prize, M. F. Chapman, Brown & Sharpe Manufacturing Company; second, C. W. Hanson, Brown & Sharpe Manufacturing Company.; third, A. Lachowicz, Calumet Foundry, East Chicago, Ind.

The S. Obermayer prize was awarded to H. Blair, Brown & Sharpe Manufacturing Company, Providence, R. I.

At the annual banquet the Joseph S. Seaman medal was awarded to the late Jesse L. Jones, formerly metallurgist of the Westinghouse Electric & Manufacturing Company, and Metallurgical Editor of METAL INDUSTRY. Mrs. Jones was present and made a short appreciative speech of acceptance. Another feature of the banquet was an extemporaneous talk by Dr. Siegfried Werner, of Dusseldorf, Germany, chairman of the International Foundrymen's committee. Dr. Werner also addressed the annual meeting.

Next Convention—1930

The next convention of the American Foundrymen's Association will be held in Cleveland the week of May 12th, 1930. There will be ample space in the municipal Auditorium for a large-scale exhibit and it is stated that sufficient meeting rooms will be available so that all activities of the convention can be taken care of in the Auditorium.

Technical Activities

Aside from the exhibit, activities at the Chicago convention of particular interest to non-ferrous foundrymen comprised a meeting and a round table luncheon on non-ferrous costs, and a meeting and round table luncheon on non-ferrous foundry problems. There was also an evening session on sand control which was intended to be of general interest, but which was confined almost exclusively to the sand problems of the gray-iron foundry. W. F. Graham of the Ohio Brass Company gave a talk on "Sand Control in a Brass Foundry," in connection with one of the shop operation courses, which, while intentionally elementary, was of considerable interest to foundrymen who had not had much previous experience in sand testing.

Foundry Costs

Nearly 200 attended the session on foundry costs, presided over by A. E. Hageboeck, chairman of the Cost committee. The meeting consisted almost entirely of discussion, in which Mr. Hageboeck was assisted by E. T. Runge and J. L. Wick, Jr. Mr. Runge presented two cost problems, one involving the cost of gray-iron castings, the other brass castings of an 85-5-5-5 composition. Those present were asked to calculate what their own cost would be in making these castings, using as a basis metal prices and direct moulding and core-room labor as

given by Mr. Runge, so that these figures would be the same in all solutions of the problem.

When the answers were tabulated and announced an astonishing variation was found in the case of both the iron and the brass castings. In the latter case the cost per 100 pounds of good rough castings had been variously estimated at from $30.25 to $56.75. It seemed obvious that there could not be such a variation in the real costs

R. R. Clarke
A Prominent Brass Foundryman and Author

of the different foundrymen who had submitted replies and Mr. Runge used this point as evidence of the need for more uniform cost accounting methods among foundrymen.

In discussion of these cost figures the matter of metal loss during melting was brought up as one factor which contributes to the difficulty of accurate cost estimating. This developed into an interesting discussion of melting losses in different types of furnaces and it was pointed out that an overall metal loss includes, not merely the loss during melting, but also the loss while pouring into the moulds, loss during sand blasting, and a further loss of metal in the reclaiming plant where sweepings, skimmings, grinding, etc., are treated. Overall losses, including these items, were named by various foundrymen as from 1.35 per cent of the melt up to 3.5 per cent for red brass and up to 10 per cent for yellow brass. Those giving the lower figures stated that they were melting in electric furnaces and estimated their true melting loss at substantially under one per cent for red brass.

At the round-table luncheon meeting which followed this session there was a discussion of ways and means as to the formation of local cost groups among non-ferrous foundries, similar to the groups already established in several localities by gray-iron foundries. It was very evident throughout all of these cost discussions that it was difficult to reach any common basis for discussion. It was also obvious that the jobbing foundry has a quite different cost problem from that with which the foundry department in a manufacturing plant has to deal. A temporary committee was formed to formulate plans which could be presented for discussion at a later meeting.

Non-Ferrous Foundry Practice

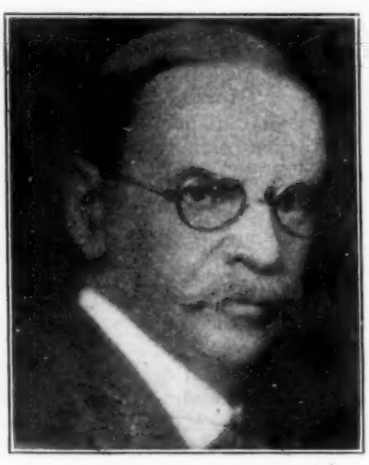
The regular session on non-ferrous foundry practice, with G. H. Clamer in the chair, had a large attendance. It opened with a paper by H. J. Roast, of Montreal, who discussed from notes "Some Practical Problems in the Brass Foundry." By "problems" Mr. Roast referred particularly to the making of unusual castings, where the foundryman had very little in the way of precedent to guide him. Included in the number were a bronze door, long and wide but of thin section, a white bronze grill to be used as a mirror frame and a combination of shoe horn and button hook cast in manganese bronze. This talk was most interesting and drew forth a considerable number of questions as to details of gating, etc.

A paper by J. B. Meier, of Newark, N. J., "Electric Arc Furnaces in a General Jobbing Brass Foundry," dealt in detail with the operation, maintenance and cost performance of small arc furnaces, melting both red and yellow brass. Comparison was made with direct-flame oil furnaces used in the same foundry. Summing up all items of direct and indirect cost, not including general overhead, the author reported an electric melting cost of $20.50 as against $31.10 for the oil furnaces, these figures in each case applying per ton of metal charged into the furnaces. One of the principal items of saving was a metal loss of 2.4 per cent in the electric furnaces as compared with an average loss of 5.7 per cent in the oil furnaces, both of these figures including a considerable amount of non-metallic material charged as metal. Other important advantages were an improvement in labor conditions and the possibility of a closer control of operating performance. It was stated that the electric furnaces required closer supervision than did the oil furnaces but that the nature of electric furnace operation made such supervision peculiarly effective.

In discussion several of those present stated that they

Two Prominent Philadelphia Brass Foundry Experts

T. H. Addie
American Manganese Bronze Company.



C. F. Hopkins
Ajax Metal Company.

were getting much lower electric melting costs than those cited by the author and that the oil-furnace costs given also seemed rather high. H. J. Roast said that in his plant as much as 1750 tons of metal had been melted in a single arc-furnace lining. H. M. St. John, of Detroit, said that, while Mr. Meier's cost figures might seem high, it should be noted that the electric rate in his plant was high and that there were other conditions, which tended to produce high costs. W. F. Graham pointed out that comparing cost figures taken in different plants was very difficult, as had been evidenced at the cost session on the preceding day.

In the absence of the authors, a paper entitled "An Open-Flame Stationary Hearth-Type Furnace for Melting Aluminum and Its Alloys," by R. J. Anderson, G. E. Hughes and M. B. Anderson, was read by title only. There was no discussion.

J. W. Bolton, Chairman of the Division of Non-Ferrous Foundry Practice, reported the activities of this Division, which has recently been organized to co-ordinate the work of all non-ferrous committees of the American Foundrymen's Association. The chairmen of these committees meet from time to time for discussion and mutual suggestions. Their work, thus brought together at one point, is co-ordinated with the work of the other Divisions through the Co-Relations committee of the Association. Among the tentative plans of the Non-Ferrous Division is the inauguration of Shop Operation courses similar to those already in successful use by other Divisions. It is also planned to bring together the present scattered information relating to sand control in non-ferrous foundries so that the work already done along this line will be more readily available to those interested. The Joint Committee on Sand Research will be urged to carry on more work which will be of direct value to non-ferrous foundrymen. Other plans of the Division, on which considerable work has already been done, are not yet in a sufficiently definite form for report.

Seaman Medal Awarded Posthumously to Jesse L. Jones

A Report of the Speech of Presentation Made by G. H. CLAMER at the Meeting of the Foundrymen in Chicago, Ill., April 8-11

"IT was my good fortune to know Jesse Jones over a period of more than twenty years. I came in contact with him frequently at technical meetings. He was on many committees. His service on committees was constantly sought, and it was a rare occasion indeed to find a gathering of men in the fields of the activities in which he was engaged to not find him present. It was one of his outstanding traits to be faithful in all things and particularly in any work that was assigned to him. Always ready and willing—no wonder he was so much called upon. He was a remarkable investigator.

The Late
Jesse L. Jones,

Who Was Awarded the Seaman Medal, Which Was Accepted for Him by Mrs. Jones.

"His personality radiated to a remarkable degree kindliness, earnestness, steadfastness, sincerity, modesty and ability. It is therefore no wonder that those from whom he sought information should be so ready to impart to him in exchange such knowledge and experience as they possessed. His co-workers always welcomed the opportunity of getting him in a quiet nook about the hotel during a technical gathering. They knew they would always receive more from Jesse L. Jones than they were able to give. His information or suggestions were always given in a spirit of extreme modesty—never in a boastful or commanding manner. His feet were always on the ground. Yes, he had imagination too—lots of it. He saw possibilities and he steadfastly pursued the course that he believed would lead him to the solution of his problem. He was not apt to be led into unfruitful fields. If he was, he was just as frank in telling of his failures as he was of his successes.

"Mr. Jones received his elementary education in the Martins Ferry, Ohio, High School, and his technical education at the Ohio State University. We always thought of him not as a "highbrow" scientist, but as a practical man; a man of applied science. His technical education at the Ohio State University equipped him well for his life's work. He had a thorough understanding and kept abreast of all the rapid advances made in the field of science in which he worked. He wished to acquaint himself with these advances, not only for a theoretical understanding, but for practical application.

G. H. Clamer,

Who Presented the Seaman Medal Posthumously to the Late Jesse L. Jones.

Prior to attending college he served an apprenticeship, working as a moulder in the iron foundry of Spence Baggs & Company, Martins Ferry, Ohio. During his college course he had charge of the experimental iron foundry of the University. With the practical knowledge thus gained he was able to talk to foundrymen in their own language—the language of practical understanding that commanded their utmost respect. After graduation, short periods were spent as Assistant Chemist with Dr. N. W. Lord, Ohio State Chemist and the Junction Iron and Steel Company of Mingo Junction, Ohio, makers of bessemer pig iron and steel. He was also employed by the West Penn Steel Company of Pittsburgh, makers of open hearth steel. In 1893 Mr. Jones became associated with the William Cramp & Sons Ship & Engine Building Company of Philadelphia, as metallurgist. It was during this employment in my home town that I first became acquainted with him. While connected with that company he aided in the development of Parson's Manganese Bronze, Hydraulic Bronze, White Brass and other non-ferrous alloys on a commercial basis.

"Mr. Jones soon after accepted a position with the Westinghouse Electric & Manufacturing Company. That was in 1903. This position he held at the time of his death. He there had charge of the chemical and physical testing work which has been largely related to the operation and products of the Westinghouse Company iron, steel, brass, and malleable foundries. In his life work it will be noted that he had practical experience in all branches of the foundry industry. The majority of foundrymen have a knowledge of but one branch of the industry. In connection with other engineers of the Westinghouse Company, he developed a copper refinery, copper rolling mill, die casting plant and a scrap reclamation and smelting plant.

"Mr. Jones wrote many technical papers. These papers always contained information of practical importance. The subjects covered a wide range: information about special alloys, heat treatment effects, methods of chemical analysis, description of apparatus for electro analysis, alloying problems, bearings, Babbitt metal, metal conservation, etc.

"He was an Associate Editor of THE METAL INDUSTRY and wrote for the "American Machinist." He prepared also a booklet for the International Correspondence School on Brass Foundry Work. We, in the non-ferrous industry, always claimed him as our own, but of more recent years he devoted much time and study to gray iron. He was Chairman of the important A.F.A. Committee on Gray Iron. He also served as a Director of the A.F.A. He was a past President of the American Institute of Metals, and a member of the Executive Committee of the Joint Committee on Moulding Sand Research. He was a member of many committees of the American Society for Testing Materials, and of the Advisory Committee on Non-Ferrous Alloys of the Bureau of Standards. He was an honorary member of the American Electroplaters' Society.

"One of his chief diversions was the study of birds. He loved the birds. He knew their habits and their songs. I had the pleasure of traveling with him in Europe as a member of the A.F.A. Delegation to the First International Foundry Congress. He was often in the country lanes long before breakfast eagerly looking for some species not familiar to him. He was an authority on the subject. In recognition of this he was made an Honorary Member of the Audubon Society. Such information as this came not from him but from others. He was a religious man and was held in highest esteem by the members of his church.

"The infirmity of which he died had been slowly creeping upon him for a long period, and finally after the most heroic effort was compelled to give up the work he so loved. Months before he relinquished his work, the Board of Awards had spoken of him as one eminently deserving of receiving one of the major A.F.A. awards. His life work was so outstanding that his name had come before the Committee for several years. The sad and unfortunate fact is that the joy of knowing that he had been awarded the Seaman Medal was not his. He was unexpectedly claimed by death.

"By unanimous action of the Board of Awards of the American Foundrymen's Association ratified by its Board of Directors I have the honor of presenting posthumously the Joseph L. Seaman medal and award to Jesse Lee Jones in recognition of his contribution to the Association and to the foundry industry.

The medal was received by Mrs. Jones who responded beautifully.

Casting White Gold

Q.—We have been using an alloy of nickel and copper bought from a reliable house, for making white gold. But in casting up this alloy mixed with pure gold, the rings come out all pitted when taken from the sand molds. A workman we used to have added small quantities of some metal to the melt just before pouring, and got wonderful results. We assayed some of the rings that he made but could find nothing but gold, nickel, and copper. Any information you can give us would be appreciated.

A.—The mysterious metal was probably magnesium. Magnesium is often used when making melts of white gold. It is a de-oxidizer, and scavenger; that is, it unites with whatever oxygen is present in your melt, thereby removing the oxides. It then goes into the slag or up the flue, and so is not found in the assay. It can be bought from your metal dealer.

Most formulas for white gold contain zinc, as well as copper and nickel. Some dealers sell prepared alloys—that is, the zinc, copper and nickel are already melted together, in proper proportion, and the jeweler needs only to melt this up with his fine gold. This saves time, and generally pays for itself.

The main cause of trouble with white gold is not the formula, but the heat treatment, either in making up the alloy, or in working the article. Your dealer will supply you with full directions for handling the metal he sells you. White gold is harder to work with than most of the old-fashioned yellow golds.

JEWELRY METALLURGY

The Electric Arc Furnace in the Brass Foundry

Practical Melting with Electric Arc Furnace in General Jobbing Brass Foundry—With Special Emphasis on Operation, Maintenance and Cost

By J. B. MEIER

Vice-President, F. and H. Foundry Company, Newark, N. J.

A PAPER READ AT THE MEETING OF THE AMERICAN FOUNDRYMENS' ASSOCIATION, CHICAGO, ILL., APRIL 8-11, 1929.

1. General Description of Work Handled

THE work handled by our foundry comes under the general jobbing class. No work is produced for its own consumption. This naturally does not lend itself so easily to any great advance planning, as it is difficult to determine what work will be required much further than three to five days in advance. And even then the schedule must frequently be broken into to meet the special needs of customers. About 75 per cent of the work is what might be termed semi-production, namely, machine work of from one to ten days' duration. The balance comes under general jobbing. The majority of the castings are pressure casting of about 3/32 of an inch section and in some cases as thin as $\frac{1}{16}$ of an inch. Very few reach $\frac{1}{8}$ of an inch and none over, unless

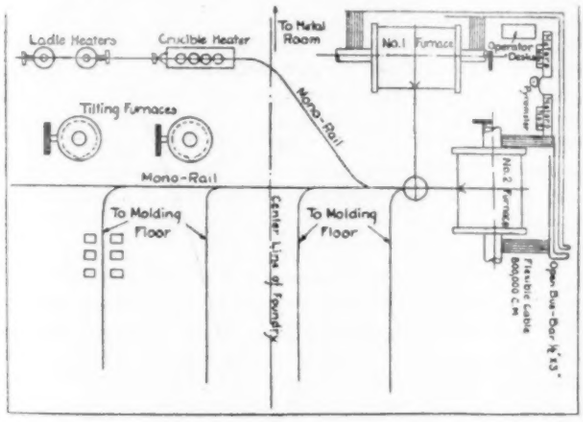


Fig. 1—Sketch Outlining the Positions of the Various Units Located in the Melting Department of the Plant

the design requires a boss or thread. These sections have been introduced without exception during the past twelve months; previous to this time the sections were 1/32 of an inch greater or $\frac{1}{8}$ of an inch. This has increased the difficulties of pouring and requires a temperature of 2200 degrees Fahr. where we formerly required 2100 degrees Fahr. The greater portion of the castings are plumbing supply castings (but not what is known as pipe fittings), practically all of which are cored work. During the year 1928 we melted in electric furnaces 40 per cent composition, 48 per cent brass, and 12 per cent high lead bearings; or a total of a little over 810 tons. One hundred additional tons were melted in oil furnaces. So far we have melted about two million pounds in the electric furnaces.

(a) Plan of Shop

The shop layout is such that the metal comes in at the rear of the shop; is weighed in charges usually 400 pounds and conveyed to the furnaces in the next section by mono-rail, from which 90 per cent is distributed forward to the main molding floor.

The sketch in Fig. 1 shows the position and general spacing of the units involved in the melting department. The space occupied by the two 350-pound capacity Detroit Electric Furnaces is about 20 feet by 20 feet. The transformers and high voltage switches are located in a vault outside the main foundry, as the city ordinances require a vault and the furnace people recommend an outdoor installation for the transformers. Attention is drawn to the location of the operating ends of the furnaces and the location of the meters, enabling one operator to take care of two furnaces with a minimum of movement. In fact, it is the writer's opinion that it would be very difficult for one operator to take care of two furnaces if they were not placed with the operating ends together.

(b) Type Metal Used

The 85-3/5 mixture is composed on the average of 2 parts ingots, one part scrap and 3 parts gates.

The brass is composed of 1 part ingots, 2 parts scrap and 3 parts our own gates.

It may be well to mention here that the word **scrap** covers a big field.

2. Operation of Furnaces

There are several features necessary to observe if one is to obtain satisfactory results from this type of furnace. We consider the following to be in about their relative order of importance:

(a) Charging and Pouring

Complete pouring and charging in the minimum time possible is essential. Naturally, the charging is more important than the pouring, for in pouring the furnace does not suffer nearly as rapid a loss of heat as during charging, for in the latter case the door is open, and the heat loss is more rapid. We have found it is necessary to add about 1 kw. for every two minutes the furnace is open above the initial five-minute period, in order to get the same temperature, other conditions being equal. In order to keep this time down to a minimum, it has been found economical to provide the operator with a helper during the charging period. When ingots or heavy pieces are used it is necesary to withdraw the carbons, but with all lighter material it has been found advantageous to allow the carbons to stay in.

We have found it more economical to charge the first heat the previous evening, only taking the precaution to try the arc to be sure no short circuit will necessitate opening the furnace in the morning. This does not apply to Mondays or holidays, however.

(b) Rocking of Furnace

The next item of importance is the rocking of the furnace. We start rocking the furnace at from 5 to 15 kw. input, usually at 10 kw., coming to a maximum at 35 to 40 kw. It has been our experience that failure to rock early enough or efficiently, namely, full rock as quickly as possible, renders it extremely difficult to get

the metal hot enough, as well as increasing the kw. input in proportion.

(c) Maintenance of Proper Arc

The next item is to maintain the proper arc. This is only accomplished by constantly keeping an eye on the meter, as the arc is manually controlled. Failure to do this, means loss of time and cold metal. It is practically impossible to get good results from these furnaces by methods which were good enough for oil or coke. Things happen too quickly, and the man operating this furnace must watch his meter or the day's check-up will tell the sad story.

(d) Accurate Records

The operator is required to mark the time of starting to charge, time of starting arc, time or kw. starting to rock, time arc is off, quantity of metal as well as the type of metal and temperature. With all this writing to do, as well as the pouring, charging, etc., it keeps a man busy if he intends to get out fifteen 400-pound heats in nine hours. By carefully checking records it is quite easy to determine in the office just where the system is falling down. If the operator is careless in his records it is practically impossible to tell where the fault lies. But because it is possible as well as practical to get accurate records (this being one of the chief assets of the electric furnace) for each day in about fifteen minutes, a complete check-up can be made on the kw. per ton, and the per cent efficiency for that day. A word or two to the operator will usually bring him back to normal or quickly disclose the source of trouble. It may be noted here that any unusual occurrence, such as carbon broken, metal not on hand, or laxness in helpers bringing crucibles, is marked on report.

(e) Slag

Another cause of inefficiency which is usually only prevalent when using particularly dirty scrap, is the slag building up in the furnace. While with ingots or clean metal this is negligent, it can under unfavorable circumstances cause almost as much trouble as insufficient rocking. It will also, if allowed to build up, work a severe handicap on the lining as it causes the metal to lay higher in the furnace, throwing more heat on the upper half, and allowing the lining to be rapidly melted away. It, of course, makes just that much more material to be heated up, with its consequent losses.

(f) Quantity Charged

The amount of metal which can be charged at one time varies considerably. All ingots, with a clean furnace, will permit 500 pounds. With about half ingots and balance scrap and gates, it is not difficult to charge 350 pounds. Turnings, skimmings, etc., work best at 300 pounds or less. Copper cable is particularly annoying, and 100 pounds in a 300-pound charge will often cause a short circuit, as it is difficult to keep it from touching both electrodes, and its high conductivity permits a great amount of current to pass.

(g) Varying Mixtures

Changing from various types of metal is not as easy as with oil or coke. If the type of metal is of a lower grade, such as yellow brass is with respect to 85 3/5, it can be done quite readily. But if it is the desire to follow a heat of aluminum bronze or nickel brass with an 85 3/5 or 88-10-2, it requires a very thorough slagging of the furnace, and even then we find it safer to run a straight brass heat next if it is possible. For if we don't, we usually find traces of aluminum in the following heat, and it has not been found as easy to change mixes for this reason. However, as we have two furnaces running most of the time, this is not as great a problem as it would be with one furnace. At the same time when it has to be done it costs an additional 10 to 15 cents for slagging, besides there is always the danger of the operator doing it carelessly and making an undue wear on the lining.

(h) Operating Labor

The operation of the furnaces does not require any special skill, but it does require constant attention to the details mentioned. The operator very quickly becomes familiar with the quickest and best way to charge, and changes his method to suit the type of metal he is handling. With light material the furnace can be successfully charged without removing the carbons, but with ingots or heavy pieces it is necessary to remove them. Breakage of carbons very soon becomes negligible and with it the usually accompanying feature of burning out the port blocks. So that very little reaming of the holes is necessary, which, when necessary and not done, causes more carbons to be broken, which forms a very vicious cycle.

In the beginning, pouring also causes several charges to go on the floor, but in a short while the operator can pour with quite a degree of accuracy, both as to **place** and **quantity.** The really greatest task is to get the operator to keep accurate records. Naturally, the type of labor melting metal is not particularly given to the arts and writing is not his by nature. It is only by using his poorly kept records as a lever to place all the blame on him that he finds in self-defense he must keep them accurate. It is often interesting as well as amusing to see how economical they are with a pencil. Our present operator never writes a single unnecessary or duplicate item. If he has two sheets he only puts the date on one, never the month or year; the office can do that, he told me once. And in writing the time, he never writes a zero if he can be understood without it, such as 3:05, he writes 3-5. Knowing the circumstances, however, we can always decipher what he means.

3. Maintenance and Repairs

The maintenance of the furnaces and accessories does not entail any more care than oil fired furnaces, although certain things must be done regularly. Once a week we have a special man oil and grease the moving parts as well as the motors.

(a) Cables

The present greatest source of expense aside from the linings are the cables. We have not been able to get the results we feel should be obtained. The design is such that it simply seems impossible to keep the cables from breaking near the furnace, where a very narrow bend is located. We get about a year's service from these cables by reversing the ends, but often they cause trouble when they get old by the strands breaking, leaving the remaining good ones to be greatly overloaded. It seems to the writer that the design could be improved so that these cables last indefinitely.

(b) Clamps

The clamps would never need renewing if the operator would never forget. But like most of us, he does forget; and he only forgets for about one second and the damage is done. During the past year, however, we only replaced one clamp so that this trouble seems negligible.

(c) Motors

Due to the reversing mechanism, it is possible to have the rocking motor on a single phase with two phase power, if the operator is careless or inexperienced. We have found that if a man burns out a motor he re-

members thereafter, but since we have only had the same two operators, we have not burned out any motors since the first two in the beginning.

(d) Linings

By far the most important feature is the linings. In the beginning we experimented with various kinds of linings. We tried several linings with a carborundum base and a glance at the chart of Fig. 2 will show a rapid rise in May, June and July, 1927. This was entirely due to these types of linings. It appears to the

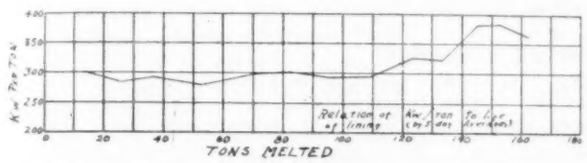


Fig. 2—**Relation Kw/Ton to Life of Lining (by 5-Day Intervals)**

writer that the insulating material could not stand up under the high conductivity of the lining and consequently was rapidly broken down, allowing great heat loss through the shell. The outside temperature of the shell measuring 550 degrees Fahr. whereas with the present linings of a brick material shows about 200 degrees Fahr., increasing with the age of the lining. Contrary to general practice, we do not renew our linings by the number of heats or visual examinations, but by the per cent of efficiency of melting. We obtain this per cent efficiency by adopting a set of standards which correspond to the manufacturers' guarantees. These are 300 kw. per ton of composition, 275 kw. per ton brass, and 240 kw. per ton for our own leaded bronzes. These figures we use as including all input, whether for relining, slagging, or any other purpose.

However, each day we calculate the standard kw. required for the metal melted that day, allowing 25 kw. extra for Mondays or days after holidays. When the lining reaches a point where conditions are such that 15 heats (400 pounds) should have been taken out in 9½ hours and cannot, at the same time show an efficiency of 10 per cent above standard, the lining is invariably in such a physical condition as to warrant its renewal. We have not found is profitable to patch any large areas, in general, and between the cost of the patching materials the loss in production, and the increased power consumption, we find the old lining will very quickly eat its head off. Under these conditions, we often remove linings which appear good, but are so thin the heat losses are far more costly than the lining.

A new lining installed costs us about $65.00. It is put in and run in with the utmost care, and not by the operator, as he is melting and could not do it properly if he wanted to. An old lining would cost us in power, if allowed to run two weeks, about $20.00 more for 150 heats, whereas it would give us a saving in linings of only about $14.00, besides the loss in production. The experience that we had proves that 10 per cent will not cover the power loss for most linings over that period, to say nothing of patching labor and material.

Since we also vary our charges considerably we do not rate our linings by heats, but by tons. Reference to Table 1 will give this tonnage, which is a little over eight hundred 400-pound heats for 1928.

(e) Patching

As explained previously, we do very little patching, our expenses being about $50 for this item for the year. In the first place, we have never found a satisfactory hot patch, and so do only what hot patching is unavoidable. If the lining is in such a condition that a major patch is warranted, we do it cold, and very thoroughly, chipping the glaze all off and dove-tailing it under the old lining, ramming it in as dry and as hard as possible. We then turn the furnace so that the patch is down and glaze it thoroughly. If done carefully and not too large, it will last the life of the lining, but it takes two to three hours, besides the power to glaze it.

(f) Transformers

Initially we had two 100 kw. transformers. While there is little doubt that they are sufficient for operating the furnaces, at the same time they permit of much overloading and it has been our experience that where an operator can speed things up and at the same time not work any harder, he will usually do it. As a result, the furnaces often pull 130 kw. and almost always 120 kw. In addition, when melting light scrap, copper or turnings, they also permit excessive short circuits, which in our case, resulted in the breakdown of a transformer right at the busiest season. Considering the slight additional cost of a larger transformer, it surely seemed like a good investment to get a 125 or 150 kw. transformer. So in replacing the burnt out one we put in a 150 kw. This not only gives us a slightly greater speed but eliminates all possibility of overloading. We had the oil inspected at the end of a year's service and found it could not be brought up to test, requiring new oil. The power company testing the oil recommended filtering every six months, which can be done on a Saturday afternoon.

(g) Oil Switches

In the beginning we had considerable trouble with the remote control switches, but since they have been properly adjusted they require little attention, except to tighten up the nuts about once a month, which seem to shake loose due to the pounding of the arm as the solenoid slams it in.

(h) Shell

The lining shell needs attention at each relining as there always seems to be some bolts which break off and must be redrilled and tapped. This causes about two hours' time at every relining, which could be saved if the design could be improved.

(i) Smoke

Due to the constant reduction in metal sections in castings, higher and higher pouring temperatures are required. Most of our work is poured at 2150 degrees Fahr. and much at 2250 degrees Fahr. The brasses especially, smoke so furiously that it was necessary to remove the fumes. This proved less expensive than anticipated by making use of our coke pit stack. By building a hood over each furnace and running 12-inch sheet iron pipe to the stack about 10 feet away, we now remove about 95 per cent of the smoke from the foundry at once. In relining the furnaces, it is only necessary to loosen a few bolts and remove the hood, so that we can lift the shell on to the floor with a hoist.

This article will be concluded in an early issue.—Ed.

Standard Nickel Plate

Q.—Will you please forward to me at your early convenience, standard specifications covering nickel plating?

A.—The only standard specifications we know of for nickel plating are those used by the Federal Specifications Board for plumbing fixtures. These require that an average thickness of nickel on brass fixtures should be 0.0001″ except upon faucet handles and other parts exposed to abrasion, where the average thickness should be 0.0002″.

—Ed.

Methods of Joining Aluminum and Its Alloys

Fluxes—Welding Materials—Preparation of the Metal—Execution of the Weld—Electrical Welding—Cast Welding—Riveting Aluminum—Part 3*

By A. EYLES

Foreman Sheet Metal Working Department, London, Midland and Scottish Railway Company, London, England.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Welds—Continued

LIGHT hammering in the cold over the area of the weld is very beneficial and should always be done where possible. In the welded condition the metal has a coarse crystalline structure, but under cold work the crystals become elongated and give texture and grain to the welded area.

Unfortunately, doubts are sometimes expressed as to the reliability or permanency of aluminum joints fabricated by autogenous welding methods. The results of tests recently carried out on oxyacetylene welded aluminum sheet should therefore be of interest. Aluminum sheet 99.5 per cent. and 98.99 per cent were the metals tested. The sheet dimensions were 20 in. by 15 in. with the welded seam in the longitudinal direction. The solution in which the sheets were tested for corrosion consisted of a mixture of Na and Ca chlorides, together with some Ca sulphate, Si O_2 Ca and Mg carbonates, free Co_2, etc. The metal was kept immersed in the solution for 80 hours, after which the solution was freshly concentrated and the metal was left for another 72 hours in the boiling solution. The average loss in weight of the sheets amounted to 0.12 per cent. In the autogenously welded joints it was observed that the greatest attack did not take place at the welded joints, but as far away from them as possible. This is probably due to the fact that at the actual weld joints the metal is recrystallized by the heat of the torch flame, so that it is in a more stable condition to resist the attack of the salt solution. Definitely separate zones are to be observed in the welded sheets, the hard non-recrystallized edges of the sheets showing a fibrous structure, while the metal adjacent to the welded joints is of a finely crystalline nature.

It will be gathered from the foregoing that sound and homogeneous welds are readily obtainable in aluminum and aluminum alloys by autogenous methods. The welds or joints present a neat and finished appearance, and possess a degree of strength practically equal to that of the original section. By judicious reinforcing or "building-up" an autogenous welded joint is in many cases actually stronger than the original metal.

Electric Welding

There are three clearly-defined methods of electric welding—the arc, resistance and electro-percussive. There is nothing mysterious about the use of electricity for welding metals, as its function is simply to produce heat.

Electric arc welding is a form of autogenous welding, in that welding can be accomplished without pressure, simply by causing the metals to melt under the heat of the arc, and then to mix and unite them as they cool; the resistance and electro-percussive processes require pressure to unite the metals.

Electric-percussive welding is a modification of resistance welding, and differs from it in being almost instantaneous. The current employed in this process is the discharge of an electrical condenser, the terminals of which are connected to the two parts to be welded, and arrangements are made whereby these can be brought rapidly together; the contact short-circuits the condenser, and thus causes an instantaneous discharge simultaneous with the pressure due to the percussion. An interesting feature by this process is that hard-drawn aluminum wires after welding are found not to be annealed, and it is thought that this may be due either to the exceedingly small area affected, or to the hardening effect of the hammer blow. Unfortunately, electro-percussive welding is limited to wires of comparatively small size on account of the large capacity required for the condenser. The resistance method of electric welding is divided into two classes, namely, butt-welding and spot welding.

In butt-welding, the two pieces are placed in clamping jaws of the welding machine, with a very short length of metal extending beyond the jaws, the ends of the metal touching each other. Immediately the electric current is switched on, the abutting ends begin to heat up. When the welding temperature is reached, the current is cut off and the weld is completed by operating a lever which applies a sudden increase of mechanical pressure, which unites the two ends of the partially molten metal. For welding aluminum wires automatic welding machines are generally used, the time at which the current is cut off being very closely regulated.

Although the application of the electric arc is wider than any other electric welding process, arc welding has not yet been adopted to any wide extent on aluminum or its alloys. The electric arc has a temperature estimated at 3,482° C. to 3,982° C. (6,300° F. to 7,200° F.), which is much greater than that of the oxyacetylene flame. In the latter the temperature of the metal is not raised much above the melting point in spite of the high temperature of the flame, whereas in arc welding a certain portion of the filling metal is vaporized and raised to the actual temperature of the arc. In arc welding it is found that the alkali halide fluxes used in gas welding are too readily volatilized to be successful, but it has recently been discovered by a patent process that cryolite, either alone or mixed with a small proportion of an alkali chloride is quite effective as a flux and remains in liquid state at the high temperature employed. The arc welding of aluminum therefore appears to be capable of development.

In spot welding aluminum and aluminum alloy sheets, plates, etc., it is customary to use electrodes tipped with an alloy material such as copper and tungsten. This alloy, due to its increased resistance, enables a higher surface resistance to be obtained between the welding points and the metal to be welded, which aids in obtaining

*Parts 1 and 2 of this article were published in our issues of September, 1928, and March, 1929.

the necessary welding temperature. Also, due to the fact that it is a poorer conductor of heat than commercial copper, it also assists in preventing the heat generated at the point of weld from being dissipated through the copper electrodes as rapidly as would be the case if these alloy tips were not used. Also it is necessary to use only about one-third to one-half of the pressure on the electrodes as is used in welding iron or steel.

The copper tungsten alloy most commonly used is known as "Elkonite," made by the Elkon Works of Weehawken, N. J. This alloy has a Brinell hardness of 225, as compared with 82 for hard copper or 30 for soft copper, while its compressive strength is four times that of hard copper. There are, however, several grades of Elkonite used for electrodes for different materials, but Elkonite W-100 is recommended for aluminum and aluminum alloys.

A recent development consists in having chromium on the contact surfaces of the electrodes. The tips of the electrodes may be plated with chromium or a piece of chromium may be inserted in the copper tips. With such tips, about 2,000 spots can be made with one pair of electrodes before replating or redressing is necessary.

The aluminum surfaces to be joined by spot welding must be clean and free from dirt or heavy oxide coating,

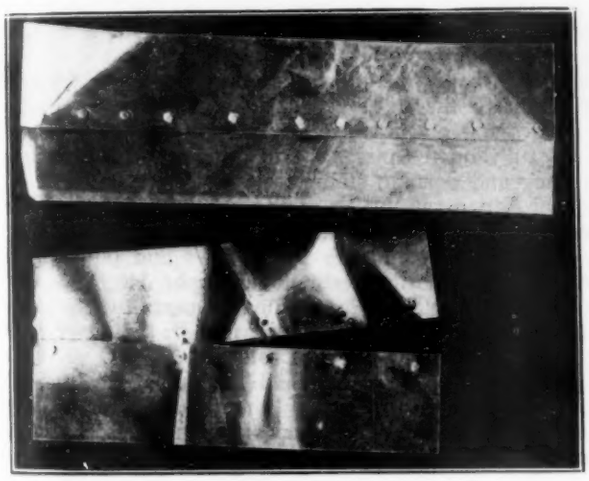


Fig. 9—Electric Spot Welds on Aluminum Sheet 0.024 in. thick

which would prevent metal to metal contact. Dirty aluminum sheet or plate may be cleaned by abrasion or dipping in a 10 per cent caustic soda solution followed by a good washing in clean hot water.

The three factors of importance in welding aluminum are: time, current and pressure. Judicious adjustment of these factors will allow of making a satisfactory spot weld under circumstances which seem most unfavorable. The current density and mechanical pressure should be the lowest that will produce a good spot. The parts to be welded should be clamped together in such a manner that good contacts are assured in making the welds. It is obvious that the efficiency of a spot welded joint, as in riveting, will depend on the number of spots. If a continuous seam is made in thin aluminum sheet the weld is equally strong as the surrounding metal.

Some examples of aluminum spot welding are shown in Figs. 9 and 10. Fig. 9 shows a satisfactory weld on aluminum sheet 0.024 in. thick. The ability to tear the sheet indicates cohesion and the high quality of the spot welded joint. In Fig. 10 at A is shown a good spot welded seam on aluminum sheet 0.028 in. thick, approximately four spots to the inch, and at B and C the results of destructive tests for weldability on aluminum sheet 0.028 in. and 0.036 in. thick. In the tests the spots were completely torn out of one sheet. The spot welded joint D was on aluminum sheet 0.064 in. thick with spots at about ¾ in. apart. The writer would like to emphasize the point that a properly made spot weld on aluminum sheet of the thin gages is able to transmit at least the same forces as a good riveted joint. In other words, it has the ability to withstand shock, stress and vibration. Electric seam welding is a development of spot welding. In this, two pieces of metal are joined together in an uninterrupted lap weld under one or between two rotary disk electrodes. It is essential that the sheets and particularly their edges be perfectly clean and free from dirt, grease, heavy oxide coating, etc., as impurities offer a high resistance to the passage of current and necessi-

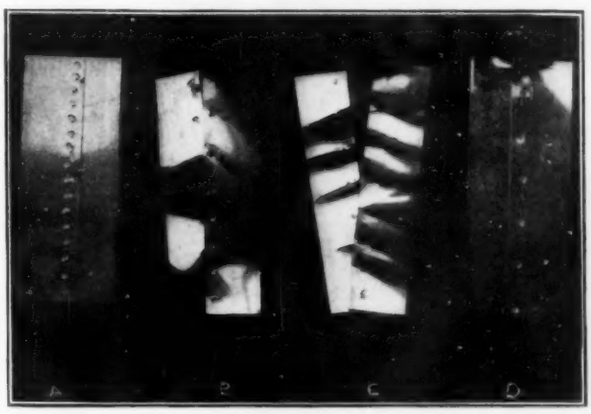


Fig. 10—Spot Welds in Aluminum

tate a higher electrical pressure, with the result that when the foreign matter is penetrated a rush of current takes place owing to the drop in the resistance, and the metal becomes impaired.

Tests recently carried out on a number of seam welded joints on aluminum sheet show that this method is not very satisfactory where high strength is required. In a seam or joint made by this process, the presence of the oxide can be clearly traced along the plane of union—it is difficult to clear the oxide film away. The electric seam welding of aluminum should at the present time be looked upon as in the experimental stage.

This article will be concluded in an early issue.—Ed.

Tinning Bronze

Q.—Will you kindly give us information as to some solution that can be used on bronze bearings to enable us to dip the bearings in a tin bath and eliminate the sticking of the outside of the bearings? In other words, we wish the tin to stick only on the inside of the machined surface of the bearing.

A.—We would recommend that you make a preparation composed of lamp black, hot water, glue and a small quantity of flour. Mix thoroughly and apply with a brush on the outside of the bearing, the same as you would apply paint.

Cover all parts of the casting where you do not desire the tin to adhere.

When completely tinned this preparation can be easily removed by immersing in hot water or an alkaline solution.

—P. W. Blair.

Electroplating Researches of the Bureau of Standards

A Report of Conference Held on April 6, 1929, in Newark, N. J.

DURING the past few years conferences have been held at the Bureau of Standards to discuss the progress of the researches on electroplating and appropriate subjects for future research by the Bureau staff and by the Research Associates of the American Electroplaters' Society. This year, at the invitation of the Newark Branch and the Research Committee of the Electroplaters' Society the conference was held in Newark on April 6th, from 9 A. M. to 5 P. M. O. J. Sizelove of the Newark Branch presided at the morning session and R. J. O'Connor, chairman of the Research Committee, at the afternoon session. About 250 persons attended the meetings, at which the following subjects were presented and discussed.

Spotting Out

W. P. Barrows, Research Associate of the American Electroplaters' Society, presented a summary of his investigation of spotting out. The detailed results of this study are now in press, as a Research paper of the Bureau of Standards, which will appear about June 1. As copies of this paper will be distributed by the Electroplaters' Society to all of its members, and to all subscribers to the Research Fund, it will not be necessary to give the details in this report. The study showed that there are two distinct types of spots on finished or plated metals such as builders' hardware.

Dr. William Blum,

In Charge of Plating Research at Bureau of Standards, Who Presented an Outline of Work Done in Chromium at the Bureau's Laboratories in Washington.

The "crystal spots" consist of radiating black crystals which form only on metals that have a copper sulphide ("oxidized") finish and are lacquered. These spots are caused or accelerated by the presence of even small amounts of sulphur, which may come from adjacent sulphur, rubber, paper or cardboard. The most effective remedies are (a) the use of lacquers found to retard such spotting, (b) the application of a thin grease film, and (c) the use of wax paper for wrapping.

The "stain spots" occur chiefly on cast metals, pores in which absorb substances from the cleaning or plating solutions. On subsequent exposure to a moist atmosphere, such compounds take up water and spread over the metal surface, causing stains of variable color and shape. The most effective remedies were found to be (a) allowing the plated articles to "spot out" by exposure to a moist atmosphere before they are given a final finishing; and (b) the application of a lacquer that has been found to prevent the absorption of moisture by the substance in the pores. Early tests showed that for this purpose the phenol-condensation lacquers are superior to the ordinary nitrocellulose lacquers. Recent tests on 24 commercial lacquers show that some of the latter type are also very efficient in preventing stain spotting.

In the discussion of this report it was pointed out that this investigation has shown for the first time the very important relation between the lacquer coating and these two types of spots.

Chromium Plating

A summary of the researches of the Bureau on chromium plating was presented by W. Blum, chief of the Electrochemistry Section.

(a) The first study was on the application of chromium to the intaglio printing plates at the Bureau of Engraving and Printing. This process is now used successfully on the plates for printing most of the paper currency and postage stamps.

(b) A general survey of the chromium plating solutions and operating conditions was made a few years ago by H. E. Haring and W. P. Barrows and published as Bureau of Standards Technologic Paper 346, a copy of which may be obtained by sending 15 cents to the Superintendent of Documents, Washington, D. C. Over 5,000 copies of this paper have been sold.

(c) In co-operation with the U. S. Public Health Service, a study was made of the Health Hazards in Chromium Plating. The conclusion from this study and from the literature, was that the principal injurious effect of chromic acid spray is upon the nasal tissues, and that no systemic poisoning occurs. As very low concentrations of chromic acid in the air cause injury to the nasal tissues, good ventilation is essential. This is preferably secured by drawing air transversely across the surface of the tanks and into narrow slots, at a velocity of 1,500 to 2,000 feet per minute. The formation of "chrome sores" or ulcers on the skin can be prevented by the use of rubber gloves, or by occasional applications of vaseline. If such sores form, a reducing agent such as hypo, or the sulphide solutions used in "oxidizing" metals, should be applied.

Details of this investigation were published in Reprint No. 1245 of Public Health Reports, by J. J. Bloomfield and W. Blum. A copy of this paper may be obtained on request addressed to the Bureau of Standards.

(d) A survey of the mechanical applications of chromium plating was made and published in a paper by W. Blum in Mechanical Engineering for December, 1928. This study showed that chromium is very valuable for increasing the life of gauges and dies, but is not entirely successful on cutting tools.

(e) At the request of the Federal Specifications Board, a specification for chromium plated plumbing fixtures was prepared. This specification has been adopted but not yet promulgated. It is based on information

available regarding present accepted practice, and not on any actual study of the service of chromium plated fixtures. It may therefore require revision in the light of experience and research. It provides that brass fixtures shall be plated either with (a) 0.0002 inch of chromium, or (b) 0.0002 inch of nickel plus 0.00002 inch of chromium.

(f) In a research in progress by H. R. Moore of the Bureau of Standards upon the constitution of chromium plating baths, it has been found that solutions of pure chromic acid have a maximum conductivity when the concentration of chromic acid is about 5 M, i.e., 500 g/L or 67 oz./gal. of CrO_3. Further studies are in progress upon the effect of trivalent chromium upon the conductivity and other properties of chromic acid solutions.

(g) H. L. Farber, Research Associate of the American Electroplaters' Society, presented a progress report of a study of throwing power in chromium plating. As the effects of trivalent chromium and iron are still to be studied, the following conclusions must be considered as tentative.

To obtain satisfactory bright deposits of chromium upon irregularly shaped articles, it is necessary to consider the following factors:

(1) The current distribution should be made as uniform as possible, as it is usually difficult to produce bright deposits if the ratio of the maximum to the minimum current density is greater than 3:1, or in some cases 2:1. Much of the industrial success in the last few years has come from the exercise of ingenuity in securing a nearly uniform current density on the articles to be plated. In general this may be accomplished by one or more of the following methods.

Have the anodes close to and parallel with the cathode surfaces. Thus an anode may be inserted inside of a tube or a reflector, or projecting portions of the anode may extend into depressions on the cathode.

Have the anodes and cathodes as far apart as practicable, e. g., from 12 to 18 inches apart.

So suspend the articles on the racks that conducting portions of the latter are close to those portions of the cathodes that tend to have excessive current densities.

Shield projecting portions of the cathode with non-conducting plates or rods, e.g., of glass.

(2) The conditions should be selected which will produce bright deposits at the minimum and maximum current densities existing on the cathodes. In general the plating range for bright deposits is wider at high temperatures and current densities than at low. It is also wider on brass and copper than on steel or nickel. Bright deposits are usually obtained on brass when the cathode efficiencies are between 5 and 20 per cent, and on steel between 8 and 18 per cent.

(3) The conditions for best throwing power should be selected, i.e., the bright deposits should be as nearly uniform in thickness as possible over the whole surface. Throwing power is defined as the "improvement in per cent, of the metal ratio above the primary current ratio." As in chromium plating the metal ratio is always less uniform than the primary current ratio, all the numerical results are negative. A value from 0 to —25 per cent is a good throwing power, one below —100 per cent is a poor throwing power.

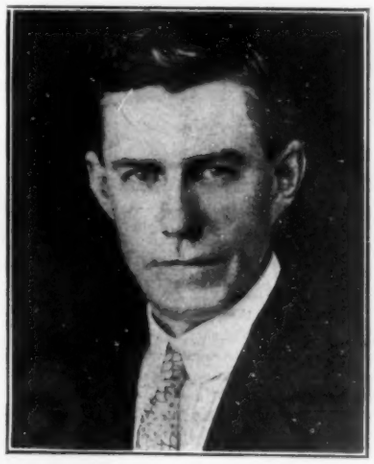
Measurements were made in a glass-lined throwing power box, with a primary ratio of 2:1. It was found that the polarization and the conductivity have practically no effect on the throwing power. The latter is determined almost entirely by the relation between the cathode efficiency and the current density. Suppose that, with a 2:1 ratio, the cathode efficiencies are 16 and 8 per cent respectively. Then the metal ratio is 4:1 and the throwing power is —100 per cent. If under other conditions the cathode efficiencies are respectively 15 and 10 per cent, the metal ratio is 3:1 and the throwing power is —50 per cent. In general those conditions should be selected under which the cathode efficiencies are most nearly uniform.

The separate effects of the principal factors are as follows:

(1) A higher content of chromic acid increases the conductivity, but decreases the throwing power.

(2) A decrease in the relative sulphate content, so that the ratio of CrO_3/SO_4 is about 200:1, increases throwing power. (With a 100:1 ratio, recommended in Tech. Paper 346, the average cathode efficiency is higher, but the actual cathode efficiencies are less uniform than with a 200:1 ratio.)

(3) Neither boric acid nor sodium dichromate produces any appreciable improvement in throwing power.



Oliver J. Sizelove,

Chairman of the Morning Session, Who Is an Associate Editor of THE METAL INDUSTRY and a Member of the Newark Branch of the American Electroplaters' Society.

(4) An increase in temperature at the same current density decreases throwing power.

(5) An increase in current density at the same temperature increases throwing power.

(6) The maximum throwing power with bright deposits is obtained at a high temperature and high current density.

(7) Very good throwing power is obtained in a solution containing 250 g/L (33 oz./gal.) of CrO_3 and 1.25 g/L (0.16 oz./gal.) of H_2SO_4, at a temperature of 55° C (131° F) and an average current density of about 30 amp/dm² (280 amp/sq. ft.). This will usually require over 8 volts. If therefore only 6 volts is available it may be preférable to use a stronger (and hence better conducting) solution, e.g., one with 400 g/L (53 oz./gal.) of CrO_3 and 2 g/L (0.27 oz./gal.) of H_2SO_4, at a temperature of 35° C (104° F) and an average current density of about 6 amp/dm² (56 amp/sq. ft.), although the throwing power and plating range will not be so favorable as under the preceding conditions.

The presentation of this paper was aided by charts and tables, which will be included in the printed report of the completed investigation.

In the discussion of chromium plating numerous questions were asked and details were considered. No significant contradictions of any of the above conclusions were reported, but many subjects for additional study were pointed out.

Analysis of Cyanide Solutions

M. R. Thompson of the Bureau of Standards reported that after many trials very nearly pure sodium and potassium cyanide have been prepared for research purposes. Analyses of these materials indicate that the "Leibig"

titration with silver nitrate is accurate. The end point is made more sensitive by the addition of potassium iodide. With this modification the results are not appreciably affected by any of the constituents likely to be present in sodium or potassium cyanide or in silver plating solutions. The method is therefore reliable for determining the free cyanide in silver baths. It is planned to extend this work to include other cyanide plating solutions, such as of copper, zinc, brass, cadmium and gold.

In the discussion of this paper it was pointed out that in brass plating solutions, carbonates interfere with the silver nitrate titration for free cyanide. If the carbonate is precipitated with barium nitrate and the barium carbonate is filtered out, accurate results can be obtained by the silver nitrate titration in the presence of iodide.

Measurements of pH in Nickel Plating Solutions

For the past several years, many electroplaters have used colorimetric methods for the measurement of the pH (or acidity) of nickel plating baths, and have thereby obtained much more uniform deposits. About two years ago another method known as the "quinhydrone electrode"

R. J. O'Connor,

Chairman of the Afternoon Session. Mr. O'Conner Is the Chairman of the Research Committee of the American Electroplaters' Society and a Prominent Member of the Bridgeport Branch.

was applied for this purpose and has been used in a few plants. About a year ago it was pointed out that the results obtained by these two methods are not consistent. In order to determine the relation of such discrepancies to the composition of the nickel baths, a joint investigation was arranged. Forty nickel solutions were prepared from purified materials by N. Bekkedahl at the Bureau of Standards. Each contained in addition to nickel sulphate, one or more of the common constituents or impurities of nickel baths. They therefore represented all types of nickel plating solutions. These were distributed to different laboratories and measurements were made on them.

The results were assembled and discussed by the above persons prior to April 6th. There was substantial agreement regarding the facts obtained and the principal conclusions, but no specific recommendations were agreed upon. It is hoped that at the convention of the American Electroplaters' Society in Detroit in July, some definite recommendations may be presented. The results may be briefly summarized as follows:

(a) The hydrogen electrode is the primary basis of all pH measurements. As the equipment required is somewhat expensive and involved, and as errors are produced by impurities such as copper and lead that may be present in commercial nickel solutions, the hydrogen electrode is not suitable for works control. Whenever reliable values can be obtained with the hydrogen electrode, the results represent the true pH.

(b) The results with the quinhydrone method are about 0.05 pH above those with the hydrogen electrode. The equipment is more intricate and expensive than that for colorimetric measurements. The results can be quickly obtained, and are free from any personal estimate of color.

(c) The colorimetric readings are in all cases considerably higher than the hydrogen electrode values. This is because of the well-known effects of high salt concentrations upon the color of indicators. As most colorimetric pH measurements in other industries are made in dilute solutions, the salt errors in such measurements are usually negligible. Nickel plating solutions are relatively concentrated and hence produce larger salt effects.

(d) In general the salt error increases with the total concentration of salts present. Most nickel plating solutions are from 1.0 N to 2.0 N in total salt content (i.e., they contain roughly from 20 to 40 oz./gal. of nickel sulphate and other salts). Such variations in total content do not change the salt error of the indicator by more than about 0.1 pH from the average value.

(e) Most of the constituents of nickel baths have no large specific effect on the salt error. Fluorides and citrates somewhat reduce the magnitude of the divergence.

(f) Solutions containing much iron change rapidly in pH, and are difficult to measure by any methods. The results, while less reliable than with iron absent, indicate that the deviation between the quinhydrone and colorimetric methods is about the same as in other solutions.

(g) The magnitude of the deviation varies with the colorimetric methods used, and its standardization basis.

(h) Increasing the temperature of nickel solutions decreases the pH of the solution, as measured by any reliable method. The decrease in pH is greater with solutions containing ammonium salts. In addition to the actual change in pH at high temperatures, the colorimetric method may be affected by the change produced by heat upon the color of the indicator and of the nickel solution. Therefore all pH measurements of nickel baths should be made at ordinary temperature, even though the baths may be operated at elevated temperatures.

(i) The average deviation of the colorimetric results from the hydrogen electrode is about 0.5 pH although with different solutions or different indicators, the deviation may range from 0.3 to 0.6 pH.

No formal recommendations were made to the conference. It was generally agreed by those engaged in the study that if feasible all pH measurements in nickel plating should be based upon and expressed in terms of the hydrogen electrode values. In this way the results of investigators or operators who use different methods of measuring pH will be on the same basis, and confusion will be avoided. Among the methods that were discussed for accomplishing this end, were the following:

(a) The use of the quinhydrone electrode, which involves a negligible correction.

(b) The use of present colorimetric standards and methods and the application by each operator of a deduction of 0.5 pH as an average deviation.

(c) The use of present colorimetric standards with a specific deduction that has been actually determined for that method and type of solution.

(d) The use of colorimetric standards especially calibrated for nickel plating, the values on the labels of which have been corrected by some fixed amount, e.g., 0.5 pH.

By any one of these procedures, measurements can be made as reproducibly as at present; and the corrected values will agree with the true pH within 0.1 or in a few cases, 0.2 pH.

In the discussion of this subject procedure (c) was especially favored. All of these possibilities will be considered in a small conference to be held prior to the Electroplaters' Convention, and to the detailed publication of the results and conclusions.

Addition Agents in Copper Electrotyping Solutions

R. O. Hull, Research Associate of the International Association of Electrotypers. In solutions containing 250 g/L (33 oz./gal.) of copper sulphate, 75 g/L (10 oz./gal.) of sulphuric acid and 1 g/L (0.13 oz./gal.) of phenol (carbolic acid), added as phenolsulphonic acid, at 40° C (104° F) and with good agitation, current densities as high as 30 amp/dm² (280 amp/sq. ft.) may be used. The deposits are smoother and harder than those from solutions with no addition agent. This solution is now being tried on a commercial scale in several plants.

Iron Deposition

C. T. Thomas, U. S. Bureau of Engraving and Printing. In solutions containing about 400 g/L (53 oz./gal.) of ferrous chloride and 450 g/L (60 oz./gal.) of calcium chloride, thick smooth deposits of iron can be produced at a temperature of 90° C (196° F) and a current density of 7 amp/dm² (65 amp/sq. ft.). The free hydrochloric acid in the solution is from 0.01 to 0.02 N. The cathodes are moved mechanically. The anodes of rolled Armco iron are suspended in porous alundum pots, to prevent particles of anode slime from reaching the cathodes and causing rough deposits. The deposited iron has a tensile strength of about 4000 kg/cm² (56000 lb/sq. in.) and an elongation of about 20 per cent.

Future Plans

The discussion of future plans emphasized the need for more information regarding the protective value of electroplated coatings against corrosion, as a basis for specifications of quality. It was pointed out that the various tests and specifications for zinc and cadmium coatings are not adequate. It was also stated that although chromium plating has been widely applied in the automobile and other industries, the present methods and specifications do not yield entirely satisfactory products. It was predicted that unless an improvement in the quality of chromium plating is made, the public will be disappointed in its performance, and other finishes will be substituted.

It was then suggested that in any study of the protective value of electroplated coatings, the Electroplaters' Society and the Bureau of Standards should cooperate closely with committees of the American Society for Testing Materials and similar organizations. The hope and belief was also expressed that the automobile industry as well as other metal industries will gladly contribute to the support of such an investigation.

At a subsequent meeting of the Executive Committee and the Research Committee of the American Electroplaters' Society, it was decided to have their two Research Associates undertake a comprehensive study of "Protection Against Corrosion by Means of Electroplated Finishes." Such a study will probably require about three years. The first subject to be investigated will be the protective value of chromium plating. As soon as possible the plans for this study will be prepared and discussed with interested firms and organizations.

Chromium Plating

Q.—We are operating a chromium plating plant in Sweden and would like to have some information on the subject. Our present procedure in chromium plating iron or steel parts is to plate in a hot cyanide copper solution for 30 minutes, rinse, plate in a hot nickel solution for 30 minutes, rinse, polish, then chromium plate for about 10 minutes. Our chromium solution is made up as follows:

Water	1,000 grams
Chromic acid, 99 per cent	250 grams
Chromsulphate	2/5 grams

Our difficulty is that the nickel peels off, taking the chromium deposit with it. Is this caused by the nickel being to hard or too thin, or is there some other cause?

Can you give us a good nickel solution for rapid plating of automobile parts made of iron and brass which are to have a final coating of chromium? Is it necessary to polish the nickel plate to a high luster before chromimum plating and then to polish the chromium surface also?

A.—There are several factors that must be understood and controlled to chromium plate successfully over nickel on steel and iron. The surface of the metal to be nickel plated must be chemically clean and the deposit must be soft. The factors that govern a soft nickel deposit are temperature, current density and control of the acidity. A nickel solution made as follows is recommended:

Double nickel salts	8 ozs.
Single nickel salts	4 ozs.
Ammonium chloride	2 ozs.
Boric acid	2 ozs.
Water	1 gal.

Temperature 120° F.; 20 amperes per sq. ft.; pH of 6 to 6.5.

If you desire a deposit that will stand the corrosion test, we would advise you to nickel plate the steel for one-half hour and follow by a one-half hour deposit in copper solution.

Polish the copper deposit and plate for 1 hour in nickel solution, nickel color, and then chromium plate.

—Oliver J. Sizelove.

Melting Sodium Nitrite and Cyanide

Q.—Would there be an explosion or any other violent reaction if a one-half ounce ball of sodium cyanide were dropped into 1 pint of molten sodium nitrite which is kept at 1300° Fahrenheit until the cyanide melts? Would there be an explosion if the cyanide were put into the nitrite in any form? Is it dangerous to heat a mixture of sodium nitrate and sodium nitrite to a red heat for a long period? Can it be heated up to any point without danger? The molten material is for use in bluing steel.

Can you tell me what is good for sodium nitrite burns?

A.—If you wish to add sodium cyanide to sodium nitrite, we would suggest that you add it before the molten state is reached. Then there will be no sudden chemical reaction.

It is not necessary to heat the sodium nitrate and sodium nitrite to 1300° F. to produce a blue color on steel; 700° to 900° F. is usually used.

All moisture must be kept from the molten material to avoid serious consequences.

We would suggest that you consult your local physician for the burns as they are very painful.

—Oliver J. Sizelove.

Details of Cadmium Plating

Methods and Equipment

By OTTO H. LOVEN
Chemist

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Author's Note—While several of the methods outlined in this paper are also used more or less in nickel, copper and brass-plating, they are more important in obtaining a high grade cadmium plate.

General-Composition-Formulae

WHILE cadmium plating does not present the problems met in chromium plating, with its narrowly defined lines of bath composition, temperature and current density, the best results are achieved only when proper methods are employed.

The majority of cadmium plating solutions are used for barrel plating at normal room temperature; the solution itself is a cyanide solution of a somewhat varying composition. The most commonly used solutions have a composition of the following max and min. concentrations:

	Min.	Max.
Cadmium (Metallic) (added as CdO or Cd OH)	2½ oz./gal.	5 oz./gal.
Sodium Cyanide (total)	4 "	10 "
Sodium Hydroxide	1 "	3 "

To this will be added, after the solution has been working for some time, varying amounts of sodium carbonate (Na_2CO_3 10 H_2O) due to decomposition of the cyanide through electrolysis.

Electrical Control

The first step in the efficient arrangement of any plating unit and more particularly those which employ high, or relatively high current densities, should be the establishment of definite electrical pressure, (voltage) and volume (amperage) at the tank. This is done by:

1. Regulating the voltage at the generator, so that when the plating units are fully loaded the pressure (voltage) across the bus bars at the tank (below the rheostat) is correct when the proper current is passing through. These determinations are made, as we all know, with a valtmeter and an ammeter. I say, as we all know, advisedly, because there are yet many plating rooms where these most important servants of the electroplater either are non-existent or only a decoration if they really exist. Many of our old timers with a profound practical knowledge, gained through many years of work at the art of plating have for one reason or another disregarded the help of these instruments, and relied solely upon other means of determining what, in their opinion, are the best electrical conditions.

In the case of cadmium solutions the correct voltage is between 6 and 9 volts for barrel plating and from 4 to 6 volt for still tank plating. The correct voltage must be found in each case and is influenced by the distance between anode and cathode and, also, to some extent, by the class of work, which is being plated. It will be found, that the closer the anodes are, up to a certain point, the less will be the voltage required, and the further out, the higher. It is well, at this point, to remark, that the voltage, at any given distance, should be held as high as possible without burning the work, as this will give the highest efficiency.

2. The amperage is regulated primarily by calculating the submerged cathode surface and should average 30 to 35 amps per square foot, whether in still or barrel plating, and the required anode surface introduced. The relation between anode and cathode surface is normally 1.5 to 1 but this will also vary slightly with the distance between them, i.e., if the anodes are moved further apart, the number of anodes may be increased, and if moved close some will have to be taken out.

Further regulation will be done through the rheostat. It is very important to have a rheostat of ample proportions and of an efficient design, as otherwise a—considerable amount of current is lost through heat. The voltage drop through the rheostat should be checked up, to ascertain that, when the unit is fully loaded, the maximum voltage required will be passed through without too much heating. I have in mind an installation, where it was next to impossible to get a glossy, hard plate even in spite of the field rheostat on the generator being advanced to maximum, and the volt meter at the generator reading 13½ volt. It was found, after a check up of the whole system, that a rheostat was used, which was designed to give a voltage drop of 6 volt, and meant to be used for a still tank, in conjunction with a 12 volt generator. As soon as a correct rheostat was installed this trouble was overcome. Such a condition, as the above related will also work considerable hardship on the generator, and shorten its life.

Mechanically agitated solutions and barrel plating solutions must be given more attention than still plating solutions due to the moving parts employed, which coat up very quickly, and thus break or at least materially weaken the current. Barrels should always be connected on the side opposite the driving unit, as otherwise the current will likely be broken at least once in every revolution, due to uneven motion in the sprocket or gear, which drives the barrel, and the contact should perferably be a friction bearing, as this method seems to be the most foolproof.

The proper arrangement of the anodes, the shape, and method of connection should also be given some thought, as an incorrect placing, or the wrong shape will cause an otherwise good installation to give poor result. As the barrel revolves, the work is carried along to a certain point, and then falls back over the other parts to the bottom. Due to this motion in the barrel, the work is

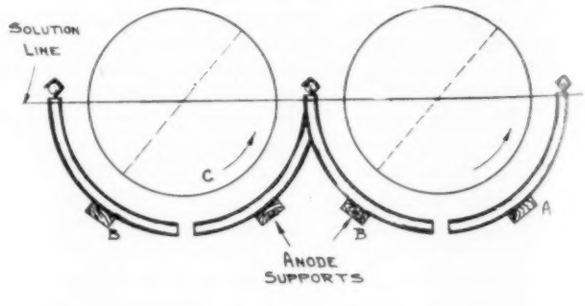


Fig 1.

Arrangement of Anodes

placed in a position as indicated in Fig. 1, by the dotted line. It is then obvious, that an anode placed on the further side as shown at B will not give much useful current to the work, as it is so far away, that a great deal of current is consumed to overcome the solution resistance; and furthermore the anodes placed as shown at (a) will amply take care of the work, and much more efficiently, as there is only a short distance for the current to travel through the solution. If then there also is another barrel alongside, as at C, there will be a tendency for that barrel to draw a certain amount of current from the upper part of anodes B. After a short while these anodes will be dissolved at that point, and the balance will fall down in the solution, and be useless. True, they may be recovered, and remelted, but that is an extra and unnecessary cost, that will be avoided by placing all anodes as indicated at A. By making the center distance at the bottom of the barrel slightly less than the distance at the top the anode will dissolve evenly, and there will only be a few ounces left around the hook. These should, of course, be saved and when enough has accumulated, sent to a foundry for remelting. An absolutely clean pot must be used as only a few tenths of a per cent of copper will badly contaminate the anodes, and render them totally unfit for use.

We have now checked the most important parts of the electrical and mechanical system. If these are in good order and the solution clean and of the above indicated composition, the unit or units are ready to turn out a good plating job, providing the work has been properly prepared.

Cleaning Operations

So many classes and kinds of work are being plated today that detailed account of all the variations of the finishing problem would cause endless repetition and waste of space, that we will only discuss the three biggest groups which use cadmium for finish and protection.

a. Small, accurately made and finished parts.
b. Small parts with rough finish.
c. Castings and housings of various kinds.

Taking the first group, we find the prefinishing problem rather easy because the surface is already clean, smooth and given a high finish. It is then only necessary to remove any traces of oil or polish paste, neutralize the caustic used for this purpose with a weak acid dip, and brighten the surface with an immersion in a cyanide dip. For the first wash, the common hot potash is used, then a rinse in water and so into a 10% muriatic dip, then again in water and last in a 4 oz./gal. sodium cyanide solution. If the work is carried in wire screen baskets, which drain easily or wired up on copper wires (for still plate), it may then, after draining for a minute, be put in the solution directly, as the cyanide carried over will not be sufficient to raise the concentration over the maximum. But where a considerable amount of cyanide will be carried over, it is best to rinse in water.

In treating the second group, where a rough surface is encountered, it is better if a smooth roll is given to the work whenever possible before washing and rinsing as it will pay dividends in brighter and cleaner looking work. In either case, the next step is a thorough wash in hot potash with reverse current, to break out all impurities imbedded in the surface, which otherwise will tend to form pockets or blisters. Then follow up with water, acid, water and cyanide as for the first group.

The third group, in many plating rooms the biggest both in weight and volume, is perhaps also the one which causes the most grief. The sand, the roughness of the surface itself, and the small pinholes that are more or less prevalent in even the best of castings, increase the finishing problem of this group manifold. Sand blasting or scrubbing with a stiff steel wire brush is the best remedy for loose sand while any imbedded sand which does not come out under this treatment may be removed by dipping in an acid dip, containing hydrofluoric acid. The gloss, which may be brought out on the previous two groups, will not be evident here, but a pure white, and very pleasing matte finish similar to the so called ormulu dip on brass, will be obtained after the parts have received either or both of the above operations. They are then washed as in group one and two, but should not be left in the cyanide dip, unless reverse current is obtainable in the plating bath.

Use of Reverse Current

The use of a reverse current is beneficial in all classes of work but especially on cast iron and malleable iron. There have been cases where small handles, with deep recesses and corners have been plated for periods of from one to two hours, and, when tested, have broken down in these places, but, when started with a 5 minute reverse current, run and then given the regular plate of say 45 minutes, showed perfect coverage under test.

Another benefit secured through the reverse current is the recovery of the cadmium which otherwise covers the danglers and spiders in the barrels.

It can also be used for stripping work, which may have to be refinished and this also saves a lot of cadmium which would be wasted if stripped in a dip. Occasionally, the reverse current action will produce still better results, if the work is plated 5 min. before reversing current.

Plating Time and Barrel Speed

The work, after being cleaned and loaded in the barrels, is now ready for the reverse current for about 5 minutes or longer, which time will have to be found by trial, and then given the correct plating current, time and barrel speed. It is of course most convenient, if the same speed may be used for all work, after a few trials, the correct speed will be found but occasionally certain jobs will be found that have to get another speed for best results. This is due to the physical shapes of the work in that flat work needs a higher speed than work evenly proportioned in all three dimensions. This may be overcome by mixing two or more classes of work. But use this method only if the different kinds of work may be separated easily. You may find the correct barrel speed at anywhere from 4 to 16 R. P. M. The time of plating varies with the coverage required. For work requiring only a light coating which will stand about 50 hours salt spray test, 25 to 30 minutes are sufficient. Work subjected to the attack of the elements, especially along the seacoast, requires a heavier plate which will stand a test of 150-250 hours. The average plating time will then be one hour or slightly more.

Testing the Plate

Every foreman naturally desires to have a check on the resistance of the coatings, and the quickest way to ascertain this is to use the now well known acetic acid peroxide test. This is prepared by taking a 1-liter graduated flask, fill it ⅔ full with water and add 35 grams glacial acetic acid. Then shake thoroughly, and pour out into a 1-liter beaker or crock. Then weigh out 10 grams sodium peroxide and add this slowly under constant stirring until it is all dissolved. Then pour back in the flask, cool to 18 degree C or 65 degree F and fill to the mark. To use, place a few pieces in a small cup or dish big enough to hold sufficient solution to cover them. Then watch until a brown discoloration shows. Note the elapsed time in seconds and compare with the following chart,

to find approximate number of hours salt spray test. This is equivalent to:

Acid Test—Seconds	Salt Spray Test—Hours
40	55
50	68
60	82
70	95
80	110
90	123
100	127
120	165
160	220
200	275
240	330
280	385
320	440

These approximate equivalents were arrived at by tabulating daily tests extending over a period of a year. The variable element is the size of, and the pressure at, the salt spray nozzle and it is necessary to check your own salt spray test performance to get your own data. The salt spray test is almost too well known to necessitate describing it. The action is similar to the flower sprayer, where two pipes are set at right angles and by blowing through the one, a fine mist is produced through water being picked from a glass or vessel held under the other. In the salt spray test, compressed air is utilized to furnish the pressure and the solution is a 1 to 4 mixture of common salt and water by weight, i.e., 2 lbs. salt to one gallon water. A box with glass rods suspended across from side to side holds the work. In front of the spray nozzle a pane of glass is set to catch the heavy solution drops, and the fine mist rises above the edge and surrounds all the work. (For further descriptions and details, see circular No. 80 U. S. Bureau of Standards.)

Interpreting Test Results

Assuming all work to be tested has a good even covering as nearly as can be determined by visual inspection, select a dozen pieces at random and subject to the acid test. Note well where the breaks occur, as this is most important in deciding what, if any, changes in plating time or barrel speed are needed.

If the breaks occur mainly on the edges or protruding lips, the speed is too high, that is, the rolling action removes the plate almost as quickly as it goes on. The remedy, slowing down the barrel speed, is obvious.

If, on the other hand, the breaks occur on flat surfaces, around perforations, it is due either to too slow barrel speed, causing the work to slide along in much the same position, rather than to tumble over, or there is too big a load in the barrel, which also stops the work from tumbling freely. Try first a smaller load and, if still unsatisfactory, change the speed.

After the acid test has indicated a satisfactory product, check the same by placing a dozen pieces in the salt spray box. Remove parts daily and wash in hot water and brush off lightly with a bristle brush. If rust is showing through that indicates the end. Do not assume that, because a piece looks rusty it is broken through as it may be a drip from another piece, as in some cases, where a part has fallen down unnoticed into the solution, it may be carried with the mist. Clean out the box with hot water at least once a week to avoid this.

Maintaining the Solution

It has been found that it is not necessary to add cadmium in the form of salts to the solution, as the anode efficiency is considerably higher than the cathode efficiency and thus tends to build up the cadmium content in the solution. When this is too marked, or when the cadmium content is too high, it has been found beneficial to use less cadmium anodes and in their place use steel anodes, made of old cold rolled steel shafting.

The cyanide is decomposed through electrolysis, forming carbonate, and must be replaced daily. The necessary amount will vary from ½ to 2 oz. per gal. per day, depending upon the tonnage per gallon per hour going through the solution. It should preferably be determined by analysis at first daily, then at long intervals, as the cyanide content plays an important role in successful plating.

Sodium hydroxide is not used up as quickly as cyanide, but needs small replacements weekly, to be determined by analysis.

The carbonate, created by electrolysis of cyanide, is beneficial in low concentrations, but wherever it goes over 4 oz./gal., should be cut down by freezing the solution, then the solution should be pumped or filtered into another tank and the carbonate, remaining in the bottom as long icicles, shovelled out and thrown away. Hard worked solutions should be filtered weekly, at least, to remove wood pulp, dust, dirt and other foreign substances, which only are harmful and tend to increase the resistance of the solution to the electric current.

Always keep switches, contacts, bus-bars and in fact everything around the plating solutions clean and shining. A little hot water and a swab, used often enough, goes a long way toward better product. Do not forget to rake out the bottom of the tank each night to remove iron or brass parts, which otherwise dissolve in the solution and contaminate it. See to it that the anode hooks are of **Steel** and not copper or any other metal. Copper dissolves rapidly and causes black spots and streaks on the work, and it is a hard and costly job to try to remove it. It can be done by boiling down the solution to 1/3 volume and then chill it with ice, take off the clear solution and clean out the sludge in which the copper has settled. The waste of cyanide is, however, considerable and if it is only a small solution, the cost of labor may be greater than the loss of the cadmium content, and therefore cheaper to dump the whole solution and build anew.

Washing the Plated Work

When the barrel is emptied of the plated work, it is preferable to do so direct into a tank with running water, as this prevents staining. A loose wood frame with wire bottom may be set into the water tank to facilitate removal of work. It is then run into another tank of cold water, then through a 5 per cent solution of strong acetic acid (or vinegar) and water, to remove any traces of cyanide, and then with warm water, about 110 degree F. Do **not use hot water,** as this dulls the plate. Then dry in good maple sawdust, or if this is unsuitable, due to sawdust clogging the holes or recesses, use a centrifugal dryer.

The work may then be lacquered if it is essential to retain the very brightest of finishes.

One small detail which has caused a lot of trouble may well be mentioned. If riveting or spinning operations are performed after plating, it will be necessary to replate to cover abrasions and tool marks, due to the softness of the metal.

If the plate is not bright enough as it comes out of the solution, it may be improved by light scratch brushing, but then it is advisable to plate longer, as even a light scratch brushing will remove considerable cadmium, especially on edges and corners. Buffing on cadmium is a distinct failure, as it cuts through on edges and corners and even a 2 hour plate is not sufficient to withstand a soft buff with kerosene and still give a good protection for the base metal. Work, which before this buffing

operation had a resistance of 5 min. in the acetic acid test, was only good for a 1½ minute test after buffing.

Decorative Value

Cadmium is a soft metal, very similar to zinc. It is therefore not suitable for work requiring a high, bright finish, such as buffed nickel, or chromium. After a long exposure in the air, it turns a flat gray color. The soft silver color may be brought back, however, by a light rubbing with a dry cloth. Its main value is in the superior rust protection as compared with copper, nickel or chromium. While these, when new, are vastly better looking, the cadmium plate is still in good shape when the others are entirely ruined.

Although as yet not widely used, cadmium plate is a very good base for antique hammered iron or wrought iron finish. This is one of the easiest finishes to make and will give very even results; after plating it is only necessary to dip in a 5% muriatic acid solution, to which is added from ½ to 2 oz. of ferric chloride per gallon, and ¼ to ½ oz./gal. copper sulphate, according to the color desired. Relieve the surface by light scratch brushing and lacquer with an invisible lacquer. The best effect is gained if the surface of the base metal is slightly roughened before plating. A very good imitation of antique old silver is produced by the same method, if the base metal is cut down and colored before plating.

Conclusion

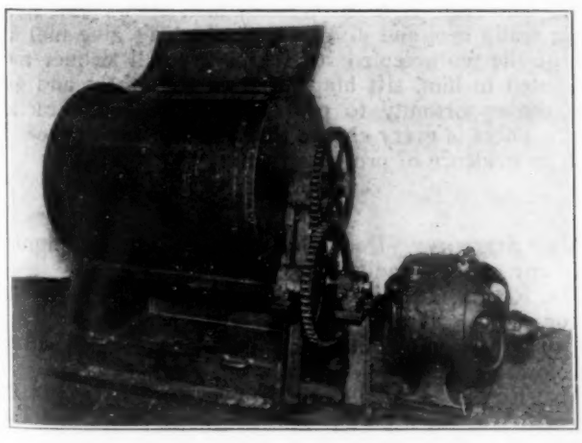
The employment of cadmium has increased very rapidly in the last few years, and with good reason, as this type of rust protection has a big field and fills its place very satisfactorily. Its usefulness would be increased many fold if it were practical to use as a sub-coating under nickel and chromium, and still achieve the same high finished surface as is now obtained through the use of copper, but with the exception of some experiments which have been reported from time to time in the trade journals, the use of cadmium in the above mentioned combination has not been worked out satisfactorily although this may still be accomplished and would then constitute one of the most important advancements in the art of metal finishing.

The recent sharp advances in the price of cadmium metal, however, have tended to retard the use thereof, as the trade cannot make sufficient profit on the output at these prices, and there are many cases known today where other finishes have been used, due to the advanced cost, which the manufacturers has not been able to pass on to the customer in the present competitive market. At present the price is 75% higher than a year ago, and if the price advances still further, the use of cadmium will surely die out and be entirely replaced with other finishes which can be applied more economically.

Reclaiming Brass Lamp Shells

Burned out electric lamps, which the average householder throws into the ash can, are considered so valuable for salvaging purposes by The New York Edison Company that a new machine called a rumbler has been perfected in the company shops to thresh the brass shells out of them.

Every year the company collects about 300,000 of these incandescent lamps from its offices, stations, and other places. Only the brass shells at the end, the part that screws into the socket, are worth saving, being sold as scrap metal.



Rumbler Used in Reclaiming Brass from Old Electric Lamps

The old method of reclaiming this metal was to break the lamps by hand. They were put into a barrel, rigged like a churn, and a dasher worked up and down. Breaking the lamps in this way not only was slow and costly but too much material adhered to the brass shells, lowering their market value.

The new motor driven rumbler is a long, round machine. A revolving steel cylinder inside is perforated with many holes that are not quite large enough for the brass shells to fall through. About a barrelful of the glass bulbs, 300 to 500 of all sizes, is poured into the cylinder. Loosely placed among them are two long steel bars, which are covered with prongs.

As the rumbler revolves at high speed, these prongs quickly knock—well, they knock glass, filament, wires and even cement loose from the brass shells with many crashing and popping noises. The debris falls through the holes in the cylinder into a steel drawer and the brass shells, clean and bright, remain inside the cylinder.

The Cylinder of the Rumbler Is Filled with the Old Electric Lamps

Flexibility and Adhesion of Lacquers

New Thoughts and Their Application in the Lacquer Industry

By LEO ROON

Technical Director, Roxalin Flexible Lacquer Company, Long Island City, N. Y.

FROM THE MONTHLY REVIEW OF THE AMERICAN ELECTROPLATERS' SOCIETY, MARCH, 1929

WHEN I sent the title of the proposed paper forward to Mr. Barrows, I must have been in a particularly ambitious frame of mind. I did not realize for the moment the broadness of the scope. Therefore, with due humility to the vastness of my subject and in consideration of the short time allotted me, I propose to speak at this meeting on flexibility, just one little thought, very important, though much neglected.

In many industries flexibility and adhesion need have nothing to do with one another, but in your particular field, the metal industry, they should and must be united to yield the results which we all seek. We have prepared several metal plates† to illustrate different types of flexibility and adhesion commonly found in practice.

Plate No. 1. You will note that the yellow pigmented lacquer peels off readily in sheets, but these sheets themselves are perfectly flexible and the film itself is tough. This is an illustration of flexibility with toughness, without adhesion.

Plate No. 2. This yellow pigmented lacquer is soft, and will remain so. Your finger nail takes it off like cheese, but it is flexible and sticks well to the metal. The old timers will never forget the old castor oil bottle or can. A little flaking, then the bottle, and if the dose was too much, this shows what happened. So we have here an illustration of flexibility without toughness or wearability, but with adhesion.

Plate No. 3. This yellow pigmented lacquer looks good, but on bending the plate, the finish cracks. Scrape it with a knife and it flies off. The older it gets the more brittle. The finish is satisfactory for cheap work where color coating to last until it reaches the consumer is sufficient. That is a common condition of temporary flexibility, temporary adhesion.

Plate No. 4. This is also a yellow pigmented lacquer but so formulated that you can bend it any number of times in the one place, in fact, until the metal cracks, but the finish does not chip or flake. It has toughness to the point that it can be readily buffed with rag wheel and limestick as you will note on these compacts.

This same type lacquer has perfect adhesion to glass as you will note from these glass articles, and the finish feels as hard as the glass itself.

You will also note from these metal pieces that stamping and drawing operations do not affect the adhesion. Tests show that these brass pieces can be stamped and drawn again after a lapse of one and a half years, and so we may say that lacquers formulated in this manner possess ideal properties for metal finishes as they combine permanent flexibility, permanent toughness, and permanent adhesion.

The sample plates were done in pigmented lacquer so that they could be seen readily, but the same situation applies in the clear lacquers, and we have several practical applications shown here.

A simple method for determining whether a lacquer will stand a stamping and drawing is to place the finished piece in an acid copper plating bath, then rinse dry and examine for copper deposited on the lacquered face. If the color of the metal makes it difficult to detect, dip the piece in a cold sulphide solution and the black copper sulphide will be detected if the lacquer film has failed.

Please bear in mind, however, that while this type of lacquer has this adhesion to a wide variety of metals, and thereby eliminates the necessity of stocking two to four different types of lacquer, and reduces the chance for error on the part of the operator, it is not a cure-all or a magical substance.

The fact is that the requirements of manufacturers even in the same industry vary considerably. Their local conditions of preparation of their work, spraying, handling, drying, etc., vary even more, and in the proper formulation of lacquers, therefore, the individual requirements must be taken into consideration from the scientific and practical ends, if you wish to get the best possible results. If your lacquer man understands the theoretical phase of his work and feels at home in a pair of overalls, he can understand your plant operating conditions. Consult him as you would your physician or attorney, tell him the whole truth, let him diagnose and prescribe, keeping in confidence such phases of your work as you specify.

May I say a word in conclusion to any purchasing agent, superintendent, or foreman here who may be classified as hard-boiled by the swarm of lacquer salesmen who call on him. These points are:

1. The biggest developments in the lacquer industry have been made principally in the last five years.
2. Bigger and finer developments in this infant industry are bound to come from progressive lacquer houses.
3. Progressive consumers of lacquer will get the first benefits of co-operation with progressive lacquer manufacturers, the others will follow.
4. Therefore if a lacquer salesman shows you something really new and different, please don't give him any one of the ten accepted stalls known to all lacquer men, but listen to him, sift him out from the others and give him the opportunity to prove his claims in a practical way. There is every chance that you will both benefit by such an evidence of progressivism.

Discussion

MR. SERGENT: Does the different colored pigment have any effect on adhesion?

MR. ROON: It does to a degree, but that is merely one factor.

QUESTION: How much heat does lacquer take without discoloration?

MR. ROON: I would say if you were to heat these lacquers here for a period of a couple of hours at 150 to 175 degrees Fahrenheit, there would be no discoloration. These are not heat resisting lacquers by any means, and we don't claim that they are such but there are heat resisting lacquers made both in the clear and pigmented lacquers to meet those conditions.

MR. KENNEDY: I would like to ask if any previous chemical treatment is necessary before the application of this lacquer.

MR. ROON: No chemical treatment other than to be absolutely sure that your metal is clean and free from grease and dirt.

† These plates are omitted in this article as the text is quite clear.

Standard Scrap Metal Definitions

Tentative Recommendations for Stabilizing Buying and Selling Secondary Metals

THE National Association of Waste Material Dealers has taken a long step forward. As a result of a discussion held at a meeting of the Metal Division in New York, October 17, 1928, it was decided to appoint a committee to study the various meanings and interpretations of certain terms used in evaluating secondary metal scrap and residues, and to submit a report based on their findings at this meeting, with such recommendations and definitions as might seem expedient at the present time.

A committee consisting of the following gentlemen was therefore appointed by Ernest G. Jarvis, chairman of the Metal Division.

T. A. WRIGHT — N. LONDON
OSCAR SPITZER — DAVID FEINBURG
J. W. PATTERSON

The purpose of this committee was to define such terms as the following:

A—Metallic yield	E—Metal
B—Metallic recovery	F—Total metallics
C—Metallic button	G—Metallics
D—Metallic contents	H—Free metal

The above terms have been and are used interchangeably, thus resulting in confusion and even ill feeling due to varying interpretations placed on them by parties in interest.

Each term will be discussed as to its meaning in general. Its application to a particular metal or group of metals can then be considered.

The committee did not understand that it was the purpose of the division at that time to debate the question of whether the fire assay or wet assay is the proper basis for arriving at the metal value of any scrap. Nevertheless, the matter had to be considered as these terms are closely related to the fire assay, and there is no question that this method is rapidly giving way to the more reliable and satisfactory method of wet assay or analysis, even though the wet method is at times more costly and time-consuming.

But it is recognized also that the fire assay will probably continue to have a place in the valuation of certain classes of material for three main reasons:

1. That the weight of the lot is too small to warrant an analysis.
2. That an approximate assay value is all that is required or needed.
3. That it has a definite value to the chemist as a means of collecting metal, or of reducing errors due to inhomogeneousness, in which event it is really a method of sampling, not of analysis. These three reasons might be illustrated as follows:
   1. A barrel of composition turnings.
   2. A grab sample of solder dross.
   3. A cyanide button on a tin dross.

They further recognized that certain of these terms have a real and definite place in the industry, provided their use is confined, restricted and defined. They therefore, subdivided them into three classes.

1. General application.
2. Fire assay.
3. Wet assay or chemical analysis.

The following terms were therefore submitted; also definitions, together with examples illustrating the conditions under which they are to be applied.

General Application

A—Free metal. By free metal is meant that metal is present alone, or in combination with one or more other metals as an alloy, and not that metal present as an oxide, silicate, slag or similar compound.

Example: Drosses, spatters, skimmings, battery lead, zinc dust.

B—Available metal. The term available metal shall be confined to the valuation of zinc dust and aluminum skimmings, drosses and ashes, and shall denote the recoverable metal figure or value, obtained by means of a specified method agreed upon beforehand, unless at some future date a standard method shall be presented and accepted.

C—Metallics. This is a technical term used by chemists in sampling and analysis to define the amount of metal left on a screen or screens, when pulverizing and preparing samples. The terms "scales" and "coarse" are often used instead. In preparing samples there may be more than one size or mesh of "metallics."

Example: For all metals.

D—Total Metallics. This term covers all metallics other than that contained in the "fines" and is, therefore, also a technical term of the chemist.

Example: For all metals.

E—Fines. By fines is meant the portion of the material passing through some certain mesh of a screen. It is sometimes called "pulp" to distinguish it from "fines", consisting of all, or containing considerable, free metal.

Example: For all metals.

Fire Assay

F—Metallic button. The term metallic button shall be used only in connection with the fire assay of (a) copper turnings and borings, in which case it is taken to mean the after-melting weight of a sample of turnings, borings or grindings from composition, red or yellow brass or copper metal; (b) battery lead and leaded drosses, in which case it is taken to mean the weight of the melted metal obtained by fluxing a sample with soda and charcoal; (c) tin dross, in which case, it is taken to mean the weight of the melted metal obtained by melting a sample under cyanide.

Notes: When the term "metallic button" is used in a contract, it is understood that the amount of metal remaining in the slag, dross or oxide is disregarded.

It is to be further noted that while the use of the fire assay method is recognized by the committee, this recognition is in no way an endorsement of it as good trade practice, but that on the contrary, they feel it is to the best interests of the industry to encourage the valuation of secondary metals by chemical analysis, as in the mining industry.

Wet Assay or Chemical Analysis

G—Metallic contents. This term is taken to mean the assay value of the metals paid for and/or penalized as determined by chemical analysis.

Examples: Lead and/or antimony in battery lead; copper and/or tin in composition; lead, tin, antimony, copper in babbitt, etc.

H—Metallic yield. This shall be ascertained by subtracting a definite percentage of the metal or metals from the assay value (or metallic contents). To illustrate, they gave two common examples:

Total lead antimony (metallic contents) less 1.5 per cent metallic yield.

Copper assay (electrolytic or its equivalent) less 1.3 per cent metallic yield.

I—Metallic recovery. They further recommended that the terms "metallic recovery" be refused recognition by this association for the subjoined reasons:

"Metallic recovery" is essentially a term used by metallurgists, chemists, etc., and its meaning is so general that its use should be confined to plants, works, processes, etc.

The committee also recommended that, until such time as standard methods of sampling and analysis are drawn up, on materials handled by the members of this Association, the methods of analysis to be used shall be those jointly agreed upon by the chemists of the buyer and seller unless (1) the method is named or outlined in the contract, or (2) covered by the specifications of the American Society for Testing Materials.

Reason for this Action

In submitting this report the committee suggested; in view of the importance of this subject, that it may be wise that this report be accepted tentatively for consideration, but that it be laid on the table for final action at the next meeting, and provided further that the report be given to the trade papers in order to bring out constructive criticism.

These recommendations were the result of extended meetings of the committee. The situation is so hopelessly mixed that a definite stand must be taken to eliminate the complex disagreements and arguments which occur daily, but the above conclusions are a clear statement of the reasons for this advance into uncharted territory.

a—If the trade, at the present time at least, insists on using unlimited terms, confusion and disagreements cannot be eliminated.

b—These disagreements can only be minimized in a measure, and that measure by stating explicitly in the contract the actual method which is to be used by the chemists in arriving at the results to be reported.

c—Further, a full description of the method of assaying might also be attached to and made a part of the contract.

d—The right of the chemist, making the assay by such a contract method, to qualify such a report by a suitable notation should be recognized.

e—Inasmuch as c and d substitute one complication for another it appears that the only way in which the whole matter can be cleared is

1st—To recognize frankly that the use of such terms is unsatisfactory, and under present conditions or tendencies, unwarranted.

2nd—To place the evaluation and scale of material covered by such terms on the same business basis as that of metal bearing materials in general: to wit, sampling and assaying by recognized chemical methods, accurate within the limits of ordinary commercial practice.

3rd—To leave the decision as to the method or methods to be employed in the hands of chemists familiar with the trend of metallurgical progress.

New French Tests for Anti-Corrosive Coatings

The precise protective value which, under varying conditions of utilization, any one of the numerous materials in common use, such as nickel, copper, chromium, etc., possesses as an external coating to shield a metal against corrosion is not always easy to determine experimentally. Consequently, considerable practical interest attaches to a new and very simple method of estimating the merits of protective coatings which M. J. Cournot, head of the Metallurgical Research Department of the Conservatoire des Arts et Metiers, Paris, recently communicated to a meeting of the French Association for the Testing of Materials.

According to M. Cournot, the best way to decide on the efficiency of a protective coating consists in finding out whether its surface is perfectly continuous or not, as it is evident that any porous coating cannot protect a metal in any degree of thoroughness. To determine whether a protective coating is porous or not, and, if it be porous, to determine the extent of its porosity, M. Cournot proposes the use of a piece of ordinary filter paper that has been previously soaked with an alkaline solution of a ferro-cyanide. When applied to the protective coating such a piece of moistened filter paper shows, wherever there is a lack of continuity in the coating, indelible colored spots brought about by the chemical reaction which has taken place between the alkaline ferro-cyanide solution and the metal below the coating. The fewer the spots, the more efficient the protecting layer.

With regard to the protection of ferrous metals by nickeling with previous coppering, the method makes it possible to determine simultaneously the porosity of the external layer of nickel and that of the intermediate layer of copper. If the nickel is porous the chemical reaction between the copper and the alkaline ferro-cyanide solution produces brown spots on the filter paper.

The same method may also be applied to test the protective qualities of zinc with previous cadmiuming. The yellowish-white spots caused in this instance by the chemical reaction between the cadmium and the ferro-cyanide, if the zinc layer is porous, cannot, however, be easily distinguished from the white coloration produced by the chemical reaction between the external zinc layer and the ferro-cyanide solution. On the other hand, the blue spots produced by the iron, in case of the porosity of the cadmium, can always be clearly and unmistakably seen. —A. C. B.

THE METAL INDUSTRY

With Which Are Incorporated

The Aluminum World, Copper and Brass, The Brass Founder and Finisher, The Electro-Platers' Review

Member of Audit Bureau of Circulations and The Associated Business Papers

Published Monthly—Copyright 1929 by The Metal Industry Publishing Company. Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE, $2.00 Per Year. SINGLE COPIES, 20 CENTS. Please remit by check or money order; Cash Should Be Registered. Advertising Rates on Application. Forms Close the First of the Month.

PALMER H. LANGDON.....Editor and Publisher
ADOLPH BREGMAN.....Managing Editor
THOMAS A. TRUMBOUR.....Business Manager
EVAN J. ROBINSON.....Advertising Manager

Address all correspondence to The Metal Industry, 99 John St., New York. Telephone, Beekman 0404. Cable Address Metalustry.

Vol. 27 New York, May, 1929 No. 5

Contents

THE METAL INDUSTRY is regularly indexed in the Industrial Arts Index

Edition this Month, 6,500 Copies. Buyer's Guide, Advertising Page 87

Editorial

Today's Business

IT is time to take stock of our business prospects. Opinion was practically unanimous that business would be good for the first quarter of the year. This prediction has been borne out. But what of the second quarter?

The first month, April, has run true to form by showing a very high rate of activity. Some look with concern, however, upon the next two months. Building is beginning to fall off and automobiles should show a seasonal decline. The question is, how much?

According to the published opinion of the Guarantee Trust Company, the immediate future is bright. The stability of the general price level is in striking contrast to the pronounced upward tendency that almost invariably characterizes an era of prosperity and there is little or no indication of those swollen inventories and overtaxed transportation facilities that are often witnessed at such times.

Their analysis of the automobile market shows that a falling off in production is likely very soon. However, the enormous number of cars in use has of itself created a steady market, as the present registration implies an ultimate replacement demand of 3,500,000 vehicles. The American automobile industry is, therefore, warranted in anticipating an indefinite period of operation around present levels. This is a rosy view but it has the merit of coming from a conservative source.

Estimates of steel production, usually considered an index of general business activity, are very optimistic. The U. S. Steel Company expects to do a volume of business of $1,500,000,000 in 1929. No predictions are obtainable from brass manufacturers of similar standing, but we know that they are very busy and with plenty of work on their books and in sight.

The prospects for the second quarter are decidedly cheerful as a whole. About the third quarter, no one has been willing to risk putting himself on record. Sufficient unto the day is the evil thereof.

Copper Has Settled

TWO months ago we pointed to twenty cent copper with apprehension. Since that time copper has gone to twenty-four cents and back to eighteen cents, where it now rests. We believe that everyone joins us in breathing sighs of relief. The fireworks are over, we hope for good. If there are any changes in price, let them be gradual.

We are certain moreover that the producers themselves are willing to let matters rest as they are. Why not? Consider for a moment the cost of production of copper. Arthur B. Parsons in a recent issue of the Engineering and Mining Journal points out that twenty-six per cent of the total production of copper costs not more than seven cents per pound; twenty-four per cent costs seven to nine cents; thirty-six per cent costs nine to eleven cents; only fourteen per cent costs more than eleven cents; less than one-half per cent costs over seventeen cents. Of course, the determining factor in price is not only the cost of production but demand, but by no stretch of imagination can it be conceived that the demand for copper increased its true value from fifteen to twenty-four cents in a few months.

Copper, stable at eighteen cents a pound, should be satisfactory to every legitimate producer and consumer. It means profits to the mine, profits to the smelter and refiner and stability to the consumer at a price which will not choke his markets.

Classified Reading

IN this age of standardization we are confronted with a singular anomaly in our periodical literature, for general public consumption. We have astounding variations in size, shape and make-up. There may be some general points of similarity but, if we may be allowed to criticize, these similarities are generally the imitation of the other's faults.

Consider for example the typical popular magazines. They have articles of all sorts and fiction mixed indiscriminately. In addition, the reading matter and advertising are so interlaced that the reader very often has to turn half a dozen leaves to read a two-page article. This is, of course, with the obvious idea of "pulling back" the reader into the advertising matter, which makes the advertising space just so much more "valuable."

It can be safely said that the custom of reputable trade and technical journals is far above this practice. In the first place, reading and advertising matter are not mixed, thus leaving the reader free to choose his subject without interference. If he is interested in technical articles he has them to himself. If he wants information about equipment and supplies, he can find them readily in the

advertising pages. There is no mixture and no interference.

It is the custom also of THE METAL INDUSTRY to classify its reading matter for the convenience of the reader. As far as possible, articles on similar subjects are grouped together in the front of each issue. In the back, we have separate departments for correspondence and discussion, new books, technical papers, shop problems, patents, new equipment, reports of associations and societies, personals, obituaries, general news of the industry, business reports, metal market reviews and prices. This is not for the convenience of the editor, as it is very often more difficult to make up a paper in this fashion than helter-skelter. It is to save the time and energy of the reader who often reads our journal in business hours and always for business reasons.

We are open to suggestions for the improvement of our make-up, but we are firm in the belief that a classified journal is far ahead of one made up by the catch-as-catch-can system.

Stabilizing Employment

UNSTABLE employment is an expensive luxury to everyone. It is no pleasure to the employer to lay off men and it is decidedly unprofitable to break in new help. The best production and the best wages in the long run are the results of steady work in one plant.

A plan for reducing labor turn-over is said to be used with considerable success by the Bridgeport Brass Company, which employs about 1800 men. Every department elects a representative each month to serve on a committee. In this way, after a fair length of time, a large proportion of the men in the shop come in contact directly with the management, which is also represented on these committees. The foremen rank as management representatives. These committees discuss all questions involved in conduct of a successful business, such as waste elimination, safety devices, reports of production, overhead, cost of materials, sales, profits, etc. As a result, any questions or grievances which the men may have are aired and answered quickly.

The concrete results of this plan are that half of the men have been with the company for more than five years. More than 900 suggestions have been made to the committees and 300 have been put into practice, with awards to those who suggested them; accidents have been reduced fifty per cent in three years.

This is one side of the employment problem, the "personnel" side. There are others, of course, but the matter of increasing the personal touch between management and worker has been recognized as of great importance, particularly in large organizations.

Light Metal Battleships

WORD has reached us of the building in Germany of a new type of battleship, no heavier than a light weight cruiser, through the judicious use of non-ferrous metals and improvements in construction. The German Admiralty announced on April 15th that the first of the 10,000-ton cruisers permitted to them, will be launched in the near future, and that such great reductions in weight have been made possible by the use of non-ferrous alloys everywhere in the vessel except the hull, turrets, protective decks and masts, that it has been possible to equip her with eleven inch-guns and give her a cruising range of more than 10,000 miles at 20 knots. This is said to be markedly ahead of similar vessels built by any other country. Another point of weight-saving is the fact that the entire hull is welded, not riveted, thus saving 550 tons.

Obviously, the saving must have been effected by aluminum alloys as the use of brass or other non-ferrous alloys would have saved little if any weight in replacing steel. Money being no object, the idea would seem to be thoroughly practical. Perhaps magnesium alloys are used, but if so they must be of a new type which is impervious to the corrosive action of sea air and salt water.

If this ship turns out to be all that is expected of her, it may be said that a new type of naval construction has been achieved; also that a new and enormous field for light metals has been opened. It is certain that much more will be known about the practical value of this type of construction after the vessel has been afloat for a year or two. In the meantime, however, manufacturers of light metal products should be alive to the situation.

Electroplaters' Programs

THE annual convention of the American Electroplaters' Society for 1929 will be held in Detroit, Mich. Definite arrangements are being made at this time but have not yet been published. In our June issue we will publish full preliminary information covering the tentative program, hotels, railroads, and other facts of interest to those who hope to attend.

We have urged at all times that everyone who can possibly get away, should attend this convention. Owners of small plants should recognize that it is a profitable investment to go to a convention; foremen of large plants should urge their plant managers to send them, and even to accompany them to the convention.

A trip is being planned by Horace H. Smith of Newark, N. J., by special car to Detroit. Those interested should communicate with Mr. Smith at 208 N. Third street, Newark, N. J.

Speaking of platers' conventions makes us point with something more than pride to the meeting held in Newark, of the Research Committee, in conjunction with the Newark Branch (see page 220 of this issue). This was one of the most important meetings of the year and one of the most profitable as well. It was attended by several hundred visitors from 14 states. The meeting comprised a fine record of constructive work done on spotting out, chromium plating, and iron plating, in addition to real progress in cyanide solution analysis and the measurement of pH of nickel solutions. The Society may well be proud of its researches.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

Black Finishes

Q.—We manufacture a line of telephone brackets, the main parts of which are made both in cast aluminum and cast iron, both of which we are finishing in crystal black. The extension links in cross section are elliptical in shape, about ⅞" x 5/8" and we have some trouble with the finish chipping off in small round spots on the aluminum pieces but very seldom on the cast iron. We give them a light dip coat with a light baking and then spray the crystal and bake according to the maker's directions. We have tried a considerable number of variations as well as different makes of enamel. We very seldom have any of this chipping on the platform which holds the phone or on the pad holder. Is there any treatment of the castings before finishing that may help this?

We enclose a sample aluminum clip which we are getting ready to replace with a flattened wire steel of the same width but probably abut ⅛" thick. We would appreciate your suggestions regarding a moderately rust proof, inexpensive finish that would harmonize with the black crystal of the larger parts. Would you recommend parkerizing for this? If so please advise us where we could get full information about this process.

A.—Aluminum has always been found difficult to finish with enamel, especially baked enamel, due to the oxide that is always present on the metal. The formation of a second metallic oxide on the surface of the aluminum might possibly solve your problem of preventing the enamel from chipping.

Prepare a solution as outlined below:

Water	1 gallon
Caustic soda, 74-76%	4½ ozs
Powdered white arsenic	2¼ ozs.
Sodium cyanide	1½ ozs.
Temperature, 180 to 200° F.	

The solution is prepared thus: to 1 pint boiling water add the caustic soda and dissolve it; then heat this to 180°F. and add the arsenic, stirring well; when it is all dissolved, the balance of the water is added and then, finally, the sodium cyanide is put in.

Immerse the aluminum parts in the solution until they darken quite perceptibly, then remove them. Wash well in cold and boiling waters, dry out by heating, then enamel by your usual methods.

If this suggestion fails to solve your problem, advise us and we will give you another method of applying the black finish to the aluminum.

In regard to the finish for the new clip, we believe the best rustproof black finish you can put on them is ferric phosphate of iron surface. The cheapest solution for this finish is as follows:

Water	1 gallon
Hydrogen acid	3 ozs.
Special powdered iron	¼ oz.
Ferric sulphate	1/16 oz.

To prepare the solution, heat the hydrogen acid to 160°F., add the iron and when it is dissolved, add the water, which should be at 200°F., then finally add the ferric sulphate. The solution is then ready for use.

Use solution at boiling temperature. Keep it in an iron kettle or tank and keep the solution covered. A line of ⅛ in. holes should be drilled down the middle of a thin sheet of steel that can be used as a cover. Bend the sheet slightly along the line of holes so that when the cover is on the tank or kettle, the holes will be slightly higher than the edges or top of the tank or kettle This will permit the steam to escape when there is an excess of it.

The articles to be treated should be placed in brass wire baskets or in tumbling clylinder made of perforated hard sheet brass with removable cover. The cylinder should be turned over about once or twice a minute so that the articles will be uniformly covered. Boil for a minimum of thirty minutes. They will become grey or greenish in color. Then remove them, rinse in boiling water, then coat them with a black enamel, baking or not, as you prefer. This will provide them with an excellent rustproof finish, which should be satisfactory.

To build up the solution, always keep the water level in the tank uniform and add hydrogen acid and iron from a stock solution prepared as follows:

Hydrogen acid	10 pounds
Special powdered iron	2 pounds

Prepare this in an acid stoneware jar. Add the iron slowly and at intervals, to avoid excess hydrogen evolution.

—C. H. P., Problem 3,846.

Dynamos and Wiring for Tanks

Q.—We operate the following solution, in tanks of the dimensions stated:

1. Nickel solution in tank 36 by 36 by 84 inches.
2. Nickel solution in 29 by 30 by 96 inch tank.
3. Nickel solution in tank 36 by 36 by 96 inches.
4. Cyanide copper solution, 24 by 27 by 72 inches.
5. Silver strike, 24 by 48 by 27 inches.
6. Silver, 27 by 30 by 84 inches.

We would like to know the sizes of dynamos and wire to use in connecting together the three nickel solutions, for connecting together the two silver solutions and the copper solution. Any added information as to connecting these tanks and also as to what rheostats and wire to use, will be appreciated.

A.—We should have been pleased to give you a satisfactory answer to your question if you had given us a basis to work upon. Take for instance your nickel solution: the tank measuring 36x36x84 practically holds 470 gallons of solution. What type of solution do you use? How many square feet of surface are plated in the solution at one time? This same question applies to every solution you have mentioned, so we can only guess at the current required.

The minimum that will be required for all tanks is 1,000 amperes at 5 to 6 volts; that is, presuming that the solutions are standard, consuming an average current density per square foot of surface area when all tanks are in operation.

A dynamo should always be large enough to give at least 50% more amperage than the minimum requirements, so we would suggest a dynamo of 1,500 amperes; 5 to 6 volts; minimum 1,000 amperes. We have figured the safe carrying capacity of the copper conducting wires as follows:

1. Nickel, 150 amperes, ½ in. round or 7/16 in. square soft copper rod.
2. Nickel, 200-250 amperes, 5/8 in. round or ½ in. square.
3. Nickel, 200-250 amperes, 5/8 in. round or ½ in. square.
4. Copper, 100 amperes, ⅜ in. round or 5/16 in. square.
5. Silver strike, 100 amperes, ⅜ in. round or 5/16 in. square.
6. Silver, 50 to 100 amperes, same as No. 4 and 5.

The total as above will average about 750 amperes. You can use your own judgment as regards the best dynamo to purchase, but do not purchase less than 1,000 amperes. As to rheostats we are in the same predicament. However, purchase rheostats based upon the above figures which will, no doubt, prove practically correct.

The dimensions for rheostat connections should be as above—the same from rheostat to tanks. The positive, or anode wire conductors should be the same size also.

—C. H. P., Problem 3,847.

Enameling White Gold Rings

Q.—We wish to ask you if you can give us any information about enameling white gold, especially in 18k. We have been always successful with yellow gold. Our trouble is with masonic rings with three or four colors. We have tried both open flame and electric furnace.

After first flushing and filing surface enamel off with a carborundum file and reheating for last flush there remain small pitholes. We use a cast ring; however, this is compact and shows no porous spots. We have tried fondant for first file and then the enamel, but with no success.

A.—You must realize that when 18k. white gold rings are used for enameling purposes, you have at least three metals in the alloy. Two of these are subject to oxidation under the heat used in enameling. Why not try flushing the white gold in 24k. gold solution before applying the plastic enamels. Most likely this thin deposit will solve your problem as you mention you have no trouble with yellow gold. The following solution can be used:

Water	1 gallon
Sodium cyanide	1 oz.
Gold cyanide	1/3 oz.
Bisulphite of soda	¼ oz.
Caustic potash	⅛ oz.

Use this at 140°F., with 3 to 4 volts and fine gold or platinum anodes.

—C. H. P., Problem 3,848.

"Hydride" in Aluminum

Q.—We are having trouble with some of our aluminum castings, and are in quite a dilemma to know how to remedy it. The situation is that we are making aluminum castings from quite a large pattern which goes on the front of an automobile body.

These castings vary in thickness, some parts being thicker or heavier than other parts, and the trouble we are experiencing is that small holes appear varying from a pin point to an eighth of an inch in diameter, which do not appear on the extreme surface, but after filing perhaps 1/32 of an inch off the outside they show up, and they do not always then show, but after a month's time they break out on the surface like a blister, or perhaps look more like it would if pushed out by something like a pin point, and upon digging into it with a pointed instrument there seems to be a powder formed as though a chemical action of some sort had taken place. As these castings are right on the outside of the body, the result is very disastrous.

We thought possibly you could advise us as to the cause and also tell us how to remedy it.

We are sending photomicrographs of the metal we use.

A.—We have examined the photomicrographs of the aluminum casting showing pits and dirt spots, and judging from this and the statement by you that it sometimes does not show until a month's time has passed, we are of the opinion that your trouble is what is known as "hydride," that is a chemical combination of hydrogen with other elements, and this shows us you are using impure material.

You may be using No. 12 alloy ingot remelted, or some other mixed alloy combined with aluminum that contains lead. There is no question but that "hydride" is causing your trouble.

To overcome this trouble make a hardener of 20% silicon, 40% copper, 40% virgin aluminum and pour in ingots and use as a hardener. Melt 80 to 84% of virgin aluminum and add 20 to 16% of hardener. We are of the opinion that your trouble will then disappear.

—W. J. R., Problem 3,849.

Throwing Power of Chromium Bath

Q. Our chromium plating solution has not the throwing power that it previously had. We are sending you a sample of the solution and would like to have you analyze it and offer your suggestions.

A.—Analysis of chromium solution:

Chromic acid	34.62 oz.
Tri valent chromium	.4 oz.
Sulphate as sulphuric acid	.46 oz.

Add 16 ozs. chromic acid to each gallon of solution.

Use lead anodes. Plate at temperature of 95° to 100° F., with current density of 50 to 75 amperes per square foot.

—O. J. S., Problem 3,850.

Nickel on Britannia Metal

Q.—We have had some trouble with nickel peeling from pure britannia metal. We handle the work as follows:

Work is placed in an electric 12 volt cleaner for 15 seconds, then swabbed, then dipped into a 50% muriatic acid dip. Then it is rinsed and dipped into a cyanide dip, then copper cyanide flashed, rinsed, placed in nickel solution and plated for one hour.

We keep the metallic content of the nickel solution at about 3 ozs. per gallon and the pH at about 6.1. The articles causing the most trouble are coffee percolators with spouts of pure britannia metal. Although they are put through a thorough inspection, no signs of peeling can be detected, nor is any blistering to be seen. After 2 months or longer in use, however, the articles are returned to the factory with nickel peeled on the spouts.

If you can give us any information that will help to clear up this situation we will be duly grateful.

A.—You do not state what metal the body of the percolator is made of, although you make it clear that only the spouts are giving trouble.

Neither do you state what materials you put into the electro-cleansing solution. At 12 volts, possibly a mild cleaner composed as follows would suit your purpose:

Water	1 gallon
Caustic potash	2 ozs.
Trisodium phosphate	2 ozs.
Sodium cyanide, 96-98%	1/3 oz.

Use at temperature of 120 to 140°F. It might also be advisable to reduce the voltage when cleaning the percolators. Try the following suggestions and perhaps it will clear up the whole trouble.

Avoid an excess of sodium cyanide in the copper solution. Before flashing in the copper solution, brush the spouts down with precipitated carbonate of lime and the finest of air floated silica mixed in equal proportions with water to which is added 4 ozs. of sodium cyanide per gallon. Brushing with this mixture will ensure a chemically clean surface on the britannia metal.

If you still have the peeling after these suggestions, then we would infer that the problem is one of excess hydrogen in the nickel solution. Hydrogen gas not only causes pitting but is frequently the cause of peeling. When cleansing has been gone over, then examine your nickel plating solution. If you think hydrogen is the cause of the peeling, peroxide additions might be of aid. Add a quarter ounce to each gallon of solution at first, or less if you think there is very little hydrogen to clear up.

—C. H. P., Problem 3,851.

Cadmium in Copper Solution

Q.—I am sending a brass strip which I have plated in a solution. I do not know what the solution is composed of. The plating took three minutes at 6 volts. What interests me mostly, is that there is no trace of silver, nickel or chromium in the bath and still I obtained a beautiful finish which looks like silver. The solution that I plated this with is nothing but an ordinary copper plating solution, which utilizes cyanide, except that I have accidentally dropped a chemical into this solution. The name I do not care to mention at the present time, but I am positive that there is no trace of either of the following metals, which would cause a white plating similar to sample: chromium, nickel, zinc, or silver. Furthermore, this plating can be obtained directly upon dirty metal.

I believe I have discovered a new method of plating, and would like to have your advice as to the finish on the sample enclosed. Anything you can do to assist me in analyzing this finish, I would appreciate very much.

I am sending you a sample of the solution.

A.—Analysis of solution:

Copper	.48 oz.
Cadmium	.21 oz.
Free cyanide	.82 oz.

You have discovered nothing new for it has been known for some time that cadmium can be deposited with copper from a cyanide solution. The color of the deposit depends upon the amount of cadmium that is added to the solution; the greater the percentage of cadmium the whiter the deposit.

—O. J. S., Problem 3,852.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained from the Commissioner of Patents, Washington, D. C., for 10 cents each

1,704,251. March 5, 1929. **Antifatigue Alloy.** Victor Noak Hybinette, Jackson, Mich., assignor to Hybinette Patents Corporation, Jackson, Mich.

A low fatigue alloy comprising at least 95% aluminum, nickel less than 2%, metals of the chromium group less than 1%, and less than 0.50% each of copper magnesium and silicon, said alloy being quenched at about 900° F. and aged between 200° F. and 400° F.

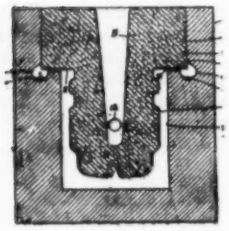
1,704,252. March 5, 1929. **Noncorrodible Structure.** Victor Noak Hybinette, Jackson, Mich., assignor to Hybinette Patents Corporation, Jackson, Mich.

A non-corrodible and non-tarnishing aluminum alloy containing less than 2% nickel, less than 1% of metals of the chromium groups, and between 0.20% and 0.50% each of copper and magnesium, said alloy being quenched at about 900° F. and aged between 200° F. and 400° F.

1,704,253. March 5, 1929. **Plastic Light Aluminum Alloy and Process of Producing Same.** Victor Noak Hybinette, Jackson, Mich., assignor to Hybinette Patents Corporation, Jackson, Mich.

The process of producing a highly plastic, strong, light aluminum alloy which comprises first alloying the aluminum with less than 2½% of heavy metals and less than ½% of copper, and ½% of magnesium to make the resulting alloy only slightly responsive to heat treatment, and bringing out the strength and plasticity by working the metal after it is quenched and before it is fully aged in intermittent periods of aging and working.

1,704,384. March 5, 1929. **Casting Magnesium and Alloy Thereof.** John A. Gann and John E. Hoy, Midland, Mich., assignors to The Dow Chemical Company, Midland, Mich.



In apparatus for casting a readily oxidizable metal, the combination of separable mold parts, one of said parts having a chamber normally open to the atmosphere wherein a non-oxidizing gas may be generated, and the other part being adapted, when in position for casting, to seal off such chamber save for a vent into the mold cavity.

1,704,733. March 12, 1929. **Alloy.** Frank A. Fahrenwald, Cleveland Heights, Ohio.

Heat resisting alloy casting of aluminum 3 to 20% and chromium 97 to 80%.

1,705,214. March 12, 1929. **Apparatus for Spraying Molten Substances.** Hendrik Johan Versteeg, Diemen, Netherlands, assignor to Christiaan Johan Jung, Amsterdam, Netherlands.

An apparatus for spraying molten substances, the combination of a container, a cover therefor having a passage with ports at its inner and outer surfaces, a hollow lever having inlet and outlet openings, means for enabling the lever to exert pressure on the cover with the lever outlet registering with the outer port of the cover passage and means for connecting a supply of compressed air or gas to the inlet opening of the hollow lever, substantially as specified.

1,705,954. March 19, 1929. **Electrolytic Deposition of Chromium.** Rudolph Auerbach, Probstdeuben, near Leipzig, Germany, assignor to Chromeplate, Inc., Union City, N. J.

The method of electrolytically depositing metallic chromium, which consists in adding to a solution containing chromic acid, soluble freshly made silicic acid and electrolyzing the solution.

1,706,130. March 19, 1929. **Heat-Resisting Material.** William E. Ruder, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York.

A heat resisting metallic article consisting predominantly of iron having a surface layer alloyed with aluminum to form a heat resisting coating and an interior portion substantially free from aluminum and containing a material preventing penetration of the aluminum into the interior of the article upon exposure to high temperature.

1,706,154. March 19, 1929. **Brazing Alloys.** Robert T. Gillette, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York.

A brazing alloy consisting mainly of copper but containing about 8% tin and an appreciable amount of silver, said alloy having a melting point in the neighborhood of 925° C.

1,706,222. March 19, 1929. **Sand-Blast Apparatus.** George C. Fatscher, New Haven, Conn., assignor to The New Haven Sand Blast Company, New Haven, Conn.

In sand blast apparatus, a mixing chamber, a removable liner therefor, having a port in its upper wall, and a normally inacessible slide gate carried by said liner for regulating the size of the port opening.

1,706,529. March 26, 1929. **Apparatus for Electrogalvanizing.** Peter Jepsen, Worcester, Mass., assignor to The American Steel and Wire Company of New Jersey.

An Electro-plating apparatus comprising an elongated tank, one series of anodes mounted in spaced relation with the bottom of said tank, a second series of anodes mounted in spaced relation above said first named series of anodes, a bus bar extending parallel with said tank, means connecting all of said anodes with said bus bar, a second bus bar extending parallel with said tank, a plurality of stationary cathodes mounted in said tank at an elevation intermediate said anodes and adapted to be engaged by the wire or other material being passed between said series of anodes to be plated.

1,706,866. March 26,1929. **Enameling Composition.** Rudolph Weimer, Sheboygan, Wis.

An enameling composition, consisting of a cold ground coating composition formed of ground silica, clay, lime, soda, boracic acid, broken pieces of glass and porcelain and water for application in a cold condition.

1,707,031. March 26, 1929. **Cleaning Composition.** Charles W. Stuart, Chicago, Ill.

A cleaning composition containing a soluble oil base, and phosphate of soda.

1,707,059. March 26, 1929. **Process for the Production of Alloys of Lead with Alkaline Earth Metals.** Guillaume Justine Kroll, Luxemburg.

A process for the production of alloys of lead with alkaline earth metals which comprises heating lead at a reacting temperature not exceeding 1100° C. with alkaline earth metal carbides in the absence of substances which form around the carbides a protective layer impenetrable by lead.

1,707,161. March 26, 1929. **Melting Pot for Light Metals and Alloys Thereof.** John E. Hoy. Midland, Mich., assignor to The Dow Chemical Company, Midland, Mich.

In a metal melting furnace, the combination of a main chamber, a supplemental chamber, a melting pot supported in the upper portion of said main chamber with its top accessible externally of said chamber and having a valve controlled gravity discharge opening, and a second pot supported in said supplemental chamber in position to receive metal discharge from said first pot.

1,707,217. April 2, 1929. **Process for Obtaining Thin Nickel Flakes.** Edmund Breuning, Hagen, Germany, assignor to The Electric Storage Battery Company, Philadelphia, Pa.

A process of obtaining nickel flakes out of compound sheeting consisting of alternating layers of copper and nickel by dissolving the copper layers in solutions of ferric salts free from chlorine and acid.

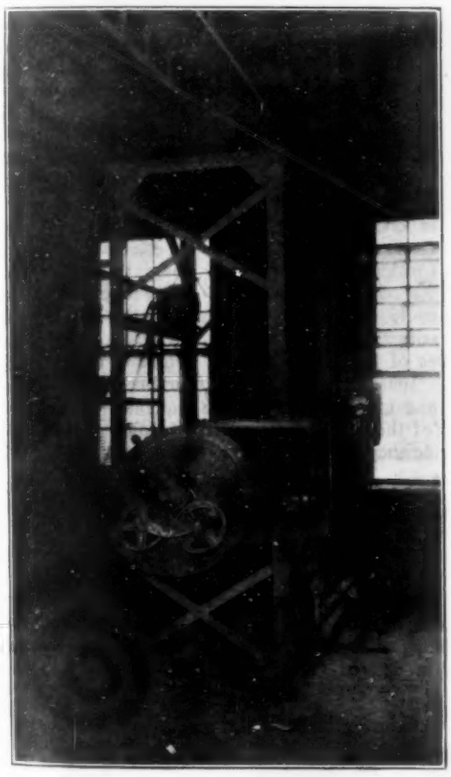
Equipment

New and Useful Devices, Machinery and Supplies of Interest

A New Type of Brass Melting Furnace

By ALEXANDER FORWARD
Managing Director, American Gas Association

Through co-operative research, sponsored by the American Gas Association, there has recently been developed a radically new type of brass furnace, which through its greatly improved efficiencies including decreased fuel, maintenance and labor costs, reduced metal loss, increased output and improved castings, bids fair to revolutionize the brass foundry industry. For the first time in the history of the brass industry the short lived crucible and refractory lined furnaces have been supplanted with a retort of special alloy metal apparently of indefinite life.



Rotary Gas Retort Brass Melter, Developed Through Research Sponsored by the American Gas Association

Furthermore, foundrymen have never before known how to avoid the great loss of metal in brass melting, nor the heavy cost of crucible maintenance, and have been at a loss as to the most economical fuel to use. In many types of furnaces metal losses during operation equal or exceed the cost of fuel, whether gas, oil or coke.

The development of a metal alloy that would withstand working temperatures in excess of 2,000 deg. F., repeatedly, in contact with molten metal, was a part of the research program, and while crucibles have a life of only 15 or 20 heats, a single retort made from the alloy finally produced has already served for more than 250 heats and is none the worse for wear. The research in connection with the development of this equipment was done under contract between the American Gas Association and the American Gas Furnace Company of Elizabeth, N. J.

This new brass melter consists of a revolving metallic retort externally fired and enclosed in a shell heavily insulted and refractory lined for heat concentration, atmospheric control and fuel conservation. The insulated sheet steel drum or shell is mounted on two bearings held by a steel frame so that it can be tilted at any desired angle. Ten gas burners, five on each side, are mounted on this drum in such a manner that they fire into its interior. Within the drum is the special alloy metal retort so mounted that it revolves with a motor and variable chain and gear drive.

Air under pressure for combustion is supplied to the gas lines serving the burners and the gas-air mixture can be so regulated as to provide any desired atmosphere—oxidizing, reducing or neutral, within the combustion chamber, which is the space between the shell and the retort. In this case a slightly reducing atmosphere is maintained so as to prevent oxidation of the retort.

A thermocouple projects into the combustion chamber and is connected with a temperature control and recording pyrometer and in this manner the temperature of the furnace is maintained automatically and regardless of the operations of pouring and recharging. The frame containing the furnace is fabricated from structural steel members and a chain hoist is used for tilting but in the later designs this is obsolete and a much neater setup is provided.

The first of these to be used in commercial practice was installed at the plant of the Trenton Brass & Machine Company, Trenton, N. J. a firm manufacturing plumbers' supplies and selling direct to jobbing plumbers and makers of sanitary ware. The various articles here are cast from commercial bronze and yellow brass compounded in the melting furnaces and poured direct.

It was indeed fortunate that this particular foundry was the first to try out the new gas furnaces for besides being one of the oldest most progressive and best managed foundries, it had used every kind of fuel and energy and every type of brass melting furnace in an effort, prolonged over many years, to reduce melting costs to a minimum and obtain the best possible control over its foundry practice and the final quality of its castings.

The plant and equipment of this company is housed in a three-story building 40 x 275 feet, with the foundry on the top floor. Prior to the innovation of the new gas melter coke fired pit furnaces, gas fired furnaces and electric furnaces had been tried and the oil fired crucible furnace had been standardized upon.

The practice is as follows: the flasks are made up on air molding machines, 16 in number, arranged along one side wall, and the pouring floor occupies that part of the room immediately adjacent. At the other end of this pouring floor and line of molding machines is a circular pouring unit consisting of two small and parallel steel rails, about six inches apart and a foot above the floor, forming a circular enclosed track, approximately 32 feet in diameter. Within the circle are four mechanical molding machines and after the flasks are made up on these they are transferred to the tracks where they remain stationery during the pouring and cooling.

The principal feature of this pouring unit is an exhauster for the zinc oxide fumes, consisting of a post in the center which carries an overhead pipe to a point directly over the track and to which is fitted a hood. In addition there is a chain hoist with a pouring shank which holds the crucible at any desired height or position above the flasks, and while pouring the fumes are kept within the hood and exhausted through an extension of the pipe through the roof.

This exhauster rotates with the center post so as to cover the entire circumference of the circular track. From 500 to 600 flasks can be made up and poured on this unit daily. Both this unit and the conventional pouring section are served with an overhead monorail system direct from the melting furnaces. With this

system of handling a pouring schedule very closely synchronizing with the heats is possible.

The core room is at the further end of the main room and is equipped with gas-fired ovens in which the cores are baked.

Pouring Brass Melted in the New Gas Retort Furnace. Note the Unique Circular Pouring Unit

Probably the greatest service rendered by this new gas furnace, aside from the elimination of crucible and refractory maintenance and remarkably low fuel consumption, is the exclusion of metal losses through volatilization and oxidation while the charge is being melted. With the best practice that can be obtained with the crucible, the volatilization losses run between five and six per cent and each crucible, as it is pulled from the furnace, has to go on the skimming table and be skimmed of the oxidized metal before it can be taken to the pouring floor.

Almost all of the composition used in the castings here is a yellow brass containing 72 per cent copper, 1½ per cent tin, 1½ per cent lead and the remainder, approximately 25 per cent zinc. The zinc has a very much lower melting point than the copper and when melted in the presence of air, volatilizes readily. This action causes a very material loss of zinc metal from the original charge. Consequently the resulting castings vary in chemical analysis from heat to heat, day to day and month to month. To eliminate this and the oxidation loss the retort of the gas melter is fitted with an airtight cover which is bolted on securely.

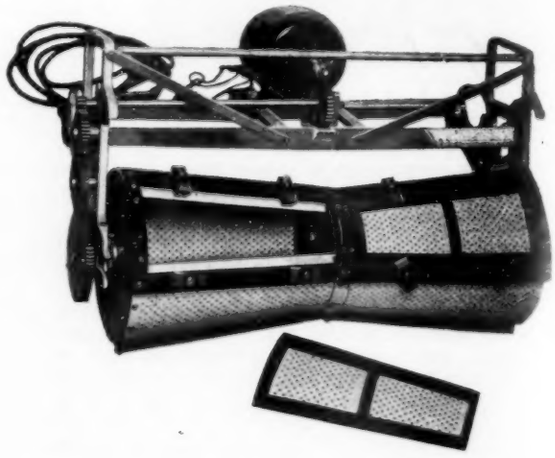
Of course when a new charge is put in certain gases are given off of which the retort must be relieved, and this is accomplished through a short pipe which is a part of the cover. As soon as these gases start to form, they are lighted and allowed to burn at the end of this pipe. In a few minutes they are exhausted, the flame extinguished and the operator thereby knows that it is time to screw the airtight cap onto the end of the pipe, thus sealing the entire retort charge from the outside atmosphere. Zinc losses occur only during pouring.

The astoundingly low fuel consumption of 2½ to 4 cu. ft. of gas per pound of brass melted is one of the principal achievements of this furnace. Other economies effected include a considerable labor saving and faster heat transfer which reduces the melting time and assists in lowering the fuel requirements. There is still another appreciable fuel saving from the fact that 800 degrees of heat remain in the retort in the morning (except Monday). Inasmuch as this gas furnace is smokeless, fumeless, noiseless and gives off only a small amount of heat, the working conditions of the foundry are much improved, which adds materially to the efficiency and industry of the operators.

Small Plating Tank Barrel

In order to make it possible for manufacturers and platers who maintain large still tanks to do small work which can most economically be plated in rotating mechanical barrels or similar equipment, the Belke Manufacturing Company, Chicago, Ill., has just placed on the market a line of small plating tank barrels which are designed for immersion in still tanks. The makers state that with the "Midget" plating barrel tanks small work such as screws, bolts, nuts and other metal products of small size can be electroplated at small expense and rapidly. Nickel, silver, copper and practically all other finishes regularly applied in still tanks can be applied in the "Midget" apparatus, one type of which is shown in the illustration. The picture also shows how the barrel is immersed in a still tank, where it can be hooked up to a light socket which operates the motor, or with a 6 volt motor, it can be hooked up to the bus bar of the plating tank. The apparatus, according to the Belke company, can be moved easily from tank to tank by one operator. It will hold from a handful up to eighteen pounds of work and will plate either amount with the same high quality deposit, it is stated.

The small portable barrel is said to be particularly economical in that it can be operated at such times as the still tanks are idle, and because small batches of work can be economically plated at any time they are required. The finish resulting from the operation of the small barrel, the makers state, is brighter and cleaner and when applied to small work in a regular still solution. The barrel is constructed for durability as well as ease of operation, the makers claim, and there are no parts to wear out or give way. No baskets are necessary for plating small parts, the whole apparatus being dipped in whatever solutions are necessary for producing a desired finish.



Double Compartment Type of Small Mechanical Plating Barrel for Use in Still Plating Tanks

Polishing and Buffing Chromium Work

Due to the special properties of chromium plate, the art of polishing and buffing metal surfaces preparatory to chromium plating has called for the development of special technique. It must almost be perfect in its finish. Chromium plate will not flow on to softer deposits and cannot be depended upon to cover up polishing marks. It will not only exactly reproduce all the underline polishing marks and scratches, but seems to magnify them. A polished surface of nickel or copper plate that appears faultless will show many polishing marks, seams, etc., after being chromium plated. Pits, seams, fan holes, and all other defects that nickel or copper plate will cover must be completely polished and buffed, according to the Hill-Curtis Company, Kalamazoo, Mich., makers of polishing equipment.

One of the most necessary essentials for polishing and buffing, preparatory to chromium plating is the proper speed of the buffing

Buffing Automobile Radiator Shells in a Chromium Plating Plant

wheels for each individual operation. The recommended speeds of polishing and buffing lathes are:

Grinding, 1200-1800 RPM.
Polishing, 1800-2200 RPM.
Buffing, 2200-2700 RPM.
Chromium buffing, 2700-3000 RPM.

With the belt-driven lathe the above speeds are comparatively simple to obtain by using different size pulleys. In the newer and more modern shops, where plant engineers are striving to get individual drive wherever possible, eliminating overhead line shaft and unsightly belts, limited speed of a motor-on-spindle electric polishing and buffing lathe has been encountered. To overcome this, the Hill-Curtis Company has developed a machine known as the "Rite Speed." It has the motor mounted on the pedestal, transmitting the power from the motor to the spindle by means of multi-V belts. With this design, the exact speed wanted can be obtained on alternating or direct current, without the use of excessive frequent changes. This machine is made in a wide variety of sizes and styles and in both the single and two spindle style of polishing lathe. The usual evils that accompany an overhead line shafting installation, such as oiling, cleaning of motors, etc., have been overcome, inasmuch as the motor is mounted as part of the machine, making it very convenient to get to, the makers claim. All dust and dirt is eliminated from the motor by means of an air cleaner.

Vibration, one of the evils responsible for buffing and polishing marks in finished work, has been eliminated by the use of friction-

"Coloring" Operation, After Shells Have Been Chromium Plated

less bearings. The lathes are equipped with large Timken taper roller bearings or ball bearings, on specification.

Unless the work comes from the chromium plating bath with a perfect finish, it is necessary to buff the surface. Also, it is often desirable to give additional snap to the surface. This process is called "chrome buffing," or "color buffing." For this operation the lathes should run at a speed of 2700 to 3000 RPM.

Ball Burnishing Equipment

A sample kit of burnishing materials has been issued for general distribution by The Abbott Ball Company, Hartford, Conn., manufacturers of various types of equipment and supplies for ball burnishing of metal products.

The sample kit just distributed and offered gratis to interested persons or companies, contains samples of the various types and sizes of burnishing materials manufactured by the Abbott company.

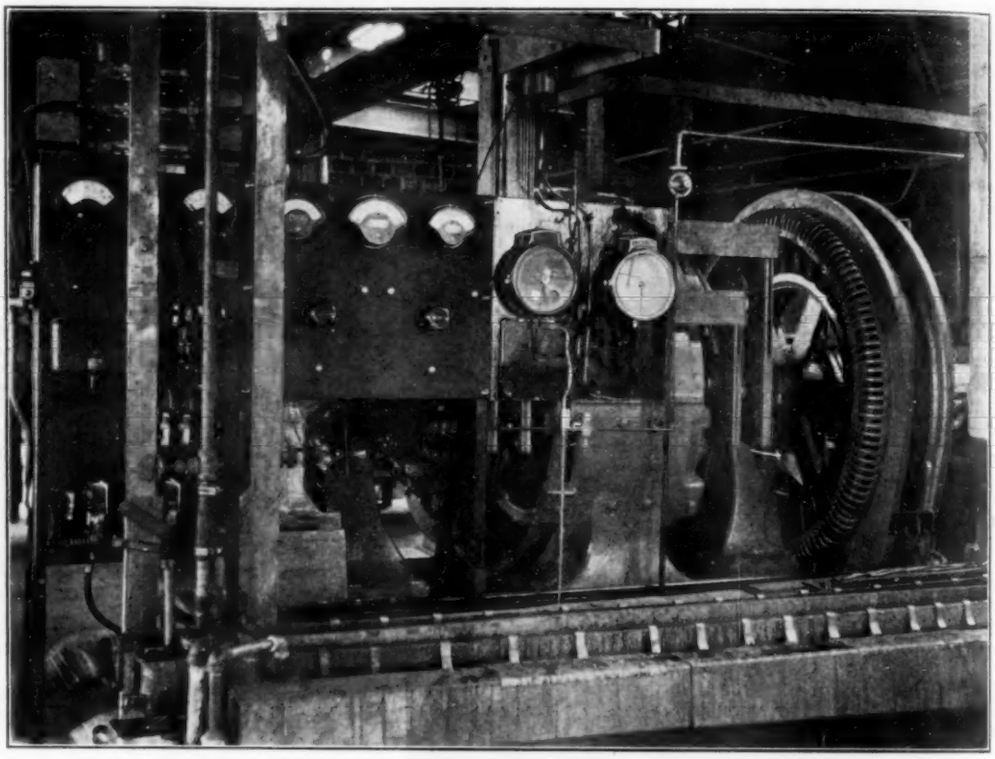
Manganese Bronze Plates

The durability and resistance to corrosion of plates of manganese copper has been demonstrated in a striking manner by the use of the material on the hull of the yacht Resolute. In this application, managanese bronze plates manufactured by the Taunton-New Bedford Copper Company, Taunton, Mass., have resisted the action of continuous immersion in salt water for fourteen years without paint or other protective coating of any kind.

In this connection it is interesting to note that the Taunton firm, which is the direct descendant of the company which was founded by Paul Revere, famous patriot of the American Revolution, supplied copper sheathing for the celebrated ship, Old Ironsides, more than one hundred years ago.

Control of Chromium Plating Solutions

The C. J. Tagliabue Manufacturing Company, 18 to 88 Thirty-third Street, Brooklyn, N. Y., manufactures and installs a line of automatic temperature controlling and recording instruments designed especially for installation on chromium baths. The company states that perfection in chromium plating depends to a great extent upon the accuracy with which solutions and other involved operations are controlled. Temperature and current density are considered by authorities on chromium deposition to be two of the most important factors in the successful operation of a chromium bath. For this reason, there has been developed a great deal of apparatus by means of which accuracy can be assured, with consequent high quality chromium deposition.



A Complete Single System Duplex Temperature Controller, Air-Operated, as Used in One of the Leading Chromium Plants in the Middle West

A wide variety of temperature controlling and recording instruments has been developed and placed on the market by the Tagliabue company, which states that its apparatus has been installed in some of the largest and most successful chromium plating plants in the country. There are steam-operated and also air-operated types of controlling instruments. These are used to regulate the temperature of tanks that are heated by steam coils, cooled by water coils or which are equipped with coils which can either heat or cool a tank as desired. Recorder-controller systems are also available. The accompanying illustration shows what is known as the TAG single system duplex temperature controlled, air operated, and the TAG recording thermometer, as installed in one of the most prominent chromium plating plants in the middle west, a plant which produces chromium plated sheets for fabrication and other chromium plated products. These control instruments are adjusted to maintain the maximum temperature variation in the vats within one-half a degree.

Listed among the products of the Tagliabue company are the following instruments: automatic steam-operated temperature controllers, single system, direct connected; duplex type controllers of the same kind; diaphragm-motor valves; air-operated automatic single system temperature controllers; duplex controllers of the same kind; single system automatic temperature recorder-controllers; various types of indicating and recording thermometers.

Prizes for Electric Heat Slogans

Seven prizes, totaling $500, will be awarded by the National Electrical Manufacturers Association and the National Electric Light Association for the best slogans to promote the use of electric heat in industry. Each contestant may submit not more than three slogans and each slogan must be accompanied by an analysis not exceeding 100 words. Preference will be given to brevity in slogans. The awards will be made on the basis of the best slogan and analysis. First prize will be $250, second, $100, third, $50, and four others will be $25 each, it is announced.

There is scarcely an industry in which electric heat is not applicable it is stated. Some of the present industrial uses of electric heat include smelting, refining, hardening, tempering and enameling of metals, and core baking in foundries.

Those interested in the contest will be given complete information upon application to NEMA-NELA Slogan Contest, in care of National Electrical Manufacturers' Association, 420 Lexington Avenue, New York City.

Slab Zinc Production

The production of slab zinc at zinc reduction plants in the United States in 1928 amounted to 651,247 short tons, valued at $79,452,000, according to statistics compiled by the United States Bureau of Mines, Department of Commerce.

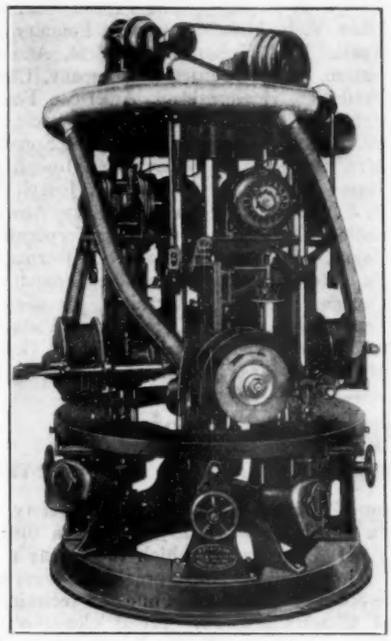
The apparent consumption of primary zinc in the United States in 1928 amounted to 578,092 tons, an increase of nearly 62,000 tons from the apparent consumption in 1927.

Rolled zinc produced in the United States in 1928 amounted to 147,061,670 pounds, valued at $12,364,908. This is a drop of 1 per cent in quantity and 10 per cent in value of output, as compared with 1927. The item "Sheet Zinc Not Over One-Tenth Inch Thick" showed an increase in production in 1928, but the other classes showed decreases. Total exports of rolled zinc increased 10 per cent.

The average selling value of rolled zinc was 8.4 cents a pound in 1928, compared with an average selling value of 9.2 cents in 1927.

Grinding, Polishing and Buffing Machine

A new type of automatic four-wheel machine for grinding, polishing and buffing of metal products has been placed on the market by the Excelsior Tool and Machine Company, East St. Louis, Illinois. The makers state that this machine is suitable for rough grinding, polishing or buffing flat, semi-flat and other articles such as castings, forgings, stampings, sheet metal parts, electric iron base plates and other similar work, the capacity of the machine and suitable containers or magnetic chucks being provided to conform to the needs of the user. The makers state that in designing the equipment, known as the No. 26 Excelsior Rotary Feed Grinding, Polishing and Buffing Machine, they have been especially careful to omit nothing that would add to its efficiency, economic application and appearance, and that at the same time every bolt and attachment is necessary to make it a complete unit for its purpose.



Automatic Grinding, Polishing and Buffing Machine

In operating this machine the rough and finished product is inserted and removed in the same position by one operator if 4 wheels are used. If one or 2 wheels is sufficient for the finish required the capacity of this machine is increased accordingly by two or four operators. Other claims made are as follows:

The wheel spindle, guard, wheel truing attachment and belt tightening device of each unit is self-contained and can be adjusted so that the grinding wheels can be set at an angle. The speed of the wheels can be changed from 1800 to 3000 R. P. M. by changing the motor pulleys. The height from the table to the wheels is regulated by the hand wheel adjustment in front of each unit. The wheels can be raised off the work and automatically locked in upper position so that the grinding wheels can be changed without interfering with the production of this machine.

Each unit is balanced by adjustable weights so that any desired pressure can be applied to each grinding wheel; at the same time the wheels are free to raise if the material to be ground is of uneven thickness, thereby relieving the grinding wheels of any undue pressure. There are 4 large upright shafts firmly secured to the upper and lower housings on which each unit slides, long adjustable bearings are provided with supports for the guide bars clamped to the main support shafts.

The feed table is driven by internal gear and pinion connected to the worm reducer which is belt connected to the motor with 3 step cone pulleys for variable table speeds, 5, 9 and 13 lineal feet per minute. Motor speed, 900 R. P. M. The working parts are of dust proof construction. Each wheel is furnished with dust hoods and flexible spouts connected to upper suction pipe, depending on the kind of work and wheels used. The wheel spindles and table have full oversize ball bearings.

Structural steel wheel guards and wheel dressers are furnished when solid grinding wheels are used. If the machine is intended for wet grinding only, the dust collectors are not furnished, and if for polishing only, the dust hoods are of a lighter construction. The motors are connected in the conduits to magnetic switch boxes with push button control for each wheel, ready to connect to your power line.

Equipment and Supply Catalogs

The American Sand Blast Room. The American Foundry Equipment Company, Mishawaka, Ind. Pamphlet describing the ventilating hopper type of equipment.

High Speed Snagging Equipment. Norton Company, Worcester, Mass. Illustrated pamphlet on various types of snagging machines and abrasive wheels for use with such machinery.

Black and White. E. F. Houghton and Company, Philadelphia, Pa. The March issue of the company's publication, containing "Psychology Goes to Work," an interesting article by Dr. Donald A. Laird, industrial psychologist.

Magnetic Separation Equipment. Magnetic Manufacturing Company, Milwaukee, Wis. Bulletin 80, on equipment for concentration of ores and minerals, together with theoretical and practical data gained during thirty years of study in this field.

General Electric Company, Schenectady, N. Y. Publications: Helicoil Sheath-Wire Resistor Units; Adjustable-varying-speed Motors; Electric Heating Equipment for Hot Galvanizing Tanks; Insulating Material for Railway and Industrial Haulage Apparatus.

Protest Against Public Utility Monopoly Competition in Electric and Gas Appliances. Merchant and Evans Company, 2035 Washington Avenue, Philadelphia, Pa. Booklet based on a complaint before the Federal Trade Commission and addressed especially to non-public utility manufacturers, distributors and dealers.

Five-Point Wurtzilite Paints, Coatings and Binders. American Wurtzilite Company, Builders Building, Chicago, Ill. A pamphlet describing Wurtzilite, a protective coating material said to be waterproof, acid and alkali proof, heat resisting, dielectric and adhesive. Among its uses are listed coatings for tanks and containers which need to be acid or alkali proof, on wood, metals, rubber, cement and other materials, in the frustration of electrolysis that causes corrosion, etc.

Production Plating—the Globe Way. The Globe Rustproofing Company, 1259 West 78th Street, Cleveland, Ohio. Very interesting illustrated pamphlet describing a large plating and rustproofing concern and outlining its various services and the processes used. Some very fine advertisements used in the past by the company are reproduced.

Data on Industrial Heating Processes. Compiled by the Engineering Department of the Surface Combustion Company, Toledo, Ohio. The engineering staff of the Surface Combustion Company has made this collection of the data sheets and catalog descriptions of all of their equipment. It is a fine collection, with a large volume of engineering data.

Budget Control: What It is and How To Do It. Published by Ernst and Ernst, 80 Maiden Lane, New York. Size 6 x 9, 40 pages. How each part of the business budget should be prepared and the principles of its effective operation together with a summary of benefits, are set forth in this revised edition of a book published originally four years ago. The book lists sixteen ways in which properly planned and directed budget benefits business. It is a concise and useful review.

Laboratory Apparatus and Reagents. Published by the Fisher Scientific Company, Pittsburgh, Pa. Size 7½ x 10½, 630 pages. This is in one sense a catalog and price-list, but in another sense, considerably more. It is compiled differently from most catalogs, being a collection of "preferred apparatus", recommended to meet the needs of modern laboratries. More than passing mention is made of the standardization work of several technical societies, such as the American Chemical Society and the American Society for Testing Materials.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

American Foundrymen's Association

HEADQUARTERS, 222 WEST ADAMS STREET, CHICAGO, ILL.

Group to Go to London

The Committee on International Relations of the American Foundrymen's Association has issued a list of those who plan to attend the Third International Foundrymen's Congress which is to take place in London, England, June 11 to 15. The list contains over sixty names and includes all who have let the committee know of their intention to attend the Congress. Of these, about forty will constitute the official American Foundrymen's Association delegation which will leave London on May 27 for the preconvention tour of Great Britain, headed by the president, vice-president and executive secretary of the Association. The party will sail from New York on May 10. The following metal men are named in the list:

L. W. Olson, director, American Foundrymen's Association, of the Ohio Brass Company, and Mrs. Olson. C. E. Hoyt, executive secretary-treasurer, American Foundrymen's Association, and Mrs. Hoyt. George H. Wadsworth, Wadsworth Core Machine and Equipment Company, Akron, Ohio, and Mrs. Wadsworth. Joseph F. Froggett, The Penton Publishing Company, Cleveland, Ohio. V. E. Minich, American Foundry Equipment Company, New York. S. T. Johnston, president, American Foundrymen's Association, of S. Obermayer Company, Chicago, and Mrs. Johnston. Fred Erb, vice-president, American Foundrymen's Association, of Erb-Joyce Foundry Company, Detroit, and Mrs. Erb. William W. Paulson, Thomas Paulson and Son, Inc., Brooklyn, N. Y., and Mrs. Paulson. E. N. Cabaniss, Joseph Dixon Crucible Company, Jersey City, N. J. J. S. Law, Joseph Dixon Crucible Company, R. E. Kennedy, technical secretary, American Foundrymen's Association. M. J. Evans, Whiting Corporation, Harvey, Ill., and Mrs. Evans. Edward Frohman, S. Obermayer Company, Pittsburgh, Pa. Herbert Weaver, Canadian Foundry Supplies, Ltd., Montreal, Canada. Robert J. Turnbull, Arcade Manufacturing Company, Freeport, Ill. John C. Pangborn, Pangborn Corporation, Hagerstown, Md. Frank Dodge, Werner G. Smith Company, Detroit, Mich., and Mrs. Dodge.

American Electroplaters' Society

HEADQUARTERS, CARE OF GEORGE GEHLING, Y. M. C. A. BOX 50, WASHINGTON AND 13th STREETS, HOBOKEN, N. J.

Detroit Branch

HEADQUARTERS, CARE OF CHARLES PHILLIPS, 1341 CAMDEN AVENUE, DETROIT, MICHIGAN

Badge and Button for Convention

The Convention Committee of the Detroit Branch of the American Electroplaters Society, which is taking care of the preparations for the Society's convention which will be held at that city July 8 to 11, 1929, has arranged to provide every member who attends the convention with a fine plated metal badge and a button in metal and enamel. They are shown in the accompanying illustration.

The medal shows buildings, ships and automobiles, typifying the diversity of business and industry carried on in the convention city. The ribbon is in red, white and blue silk and the button is attached to the ribbon.

The round button can be detached and worn in the lapel, and will be very fine as a memento of the convention for the platers to wear in the years to come.

Los Angeles Branch

HEADQUARTERS, CARE OF M. D. RYNKOFS, 1350 WEST 25th STREET, LOS ANGELES, CALIFORNIA

Second Meeting Held

The group of Pacific Coast electroplaters who have started a branch of the American Electroplaters' Society and applied for a charter from the main Society, held a second meeting on April 10, when 29 attended a dinner at the Los Angeles Y. M. C. A., after which there was a technical discussion.

The meeting was presided over by **Clarence Thornton**, temporary chairman, while the technical session was in charge of **Charles Russell**. Metal cleaning was the principal topic of the evening. **P. A. Boeck** of the Oakley Chemical Company gave a comprehensive talk on this subject, explaining the action of cleaners with and without electric current, and the effects of direct and reverse currents. Several of those present testified to the value of the copper cleaner strike, by means of which they were able to overcome serious cleaning troubles.

It is expected that a permanent charter for the organization of this branch will be received from the Supreme President of the Society shortly, after which an open smoker meeting will be held.

Rochester Branch

HEADQUARTERS, CARE OF CHARLES GRIFFIN, 24 GARSON AVENUE, SYRACUSE, NEW YORK

Annual Session and Banquet Held

The Rochester Branch of the American Electroplaters' Society held its seventeenth annual educational session and banquet at the Powers Hotel, Rochester, April 19.

At the session in the afternoon, Frank Kolb, chief chemist of the Bausch and Lomb Optical Company was the first speaker introduced by Clarence Reama, president of the Branch. Mr. Kolb spoke on various interesting topics and in conclusion he extended an invitation to all elligible men to join the American Electroplaters' Society.

The second speaker was George B. Hogaboom, of Matawan, N. J. Mr. Hogaboom conducted his famous "Question Box." To say that this went over big is to fail entirely to give Mr. Hogaboom the credit he deserves for his fine work at the session. It was the event of the day, and all the platers in Rochester are looking forward to the day when they will be able to enjoy the "Question Box" again.

After the session a good chicken dinner was served and this was followed by a very good vaudeville entertainment. There was dancing until a late hour.

The committee which prepared the session and banquet should be given great credit for their admirable work. The committee consisted of Clarence Reama, Charles Griffin, Raymond Lopez, William Hart, John W. Snyder, Eli J. Beaudry, S. P. Gartland and Frank Mesek.

CHARLES GRIFFIN, Secretary.

American Electrochemical Society

HEADQUARTERS, CARE OF COLIN G. FINK, COLUMBIA UNIVERSITY, NEW YORK CITY

The 55th Meeting of the American Electrochemical Society will be held at Toronto, Canada, on Monday, Tuesday, Wednesday, and Thursday, May 27, 28, 29, and 30, 1929. Reduced railroad fares go into effect May 15.

The headquarters of the meeting will be the University of Toronto. The spacious well-equipped dormitories will be at the entire disposal of the visiting members and guests. Elaborate facilities are available for the technical sessions and discussions. Meals will be served in the world-famous Hart House.

Reservations for rooms should be sent as soon as possible to Prof. Jas. T. Burt-Gerrans, Toronto University.

The following is a part of the advance program which will be of interest to the metals and electroplating trades:

Advance Program, Toronto Meeting

Monday, Morning, May 27. Scientific Session:
"Electro-Magnetic Characteristics of Electrochemical Processes," Floyd T. Taylor, Presiding.

Monday Afternoon (A). Informal Open Discussion:
"Present and Future of Canada's Electrochemical Industries." (Raw materials, transportation, markets, new products, new applications, etc.), R. A Witherspoon, Presiding.

Monday Afternoon (B). Symposium:
"Modern Methods in Teaching Electrochemistry," Prof. Roy L. Dorrance, Chairman.

Monday Evening:
Illustrated Address by Prof. Harry A. Curtis, of Yale.

Tuesday Morning, May 28. Scientific-Technical Session:
(Electric Furnaces, Electro-Reduction, Corrosion, etc.)

Tuesday Afternoon:
Visits to Industrial Plants.

Wednesday, Morning, May 29:
Session on Electrodeposition, to be held jointly with the Toronto Branch, American Electroplaters' Society. (Iron, Cadmium, Chromium, etc.)

Thursday, May 30:
All-day excursion to International Nickel Plant, Port Colborne.

Lighting Equipment Association

HEADQUARTERS, 711 GRAYBAR BUILDING, LEXINGTON AVENUE, NEW YORK CITY

Eighth Annual Meeting

The eighth annual meeting of the Artistic Lighting Equipment Association was held at Virginia Beach, Va., in February. The following new officers were elected: President, C. A. Bridges, president of Moe-Bridges Company, Milwaukee, Wis.; vice-president, Herman Plaut, of L. Plaut and Company, New York City. An advisory committee of directors was appointed to meet monthly with the managing director of the association, G. P. Rogers.

It was decided to hold the mid-summer meeting of the association at the Hotel Chelsea, Atlantic City, N. J., June 5 to 8, inclusive, 1929. This will take place during the annual convention and exhibition of the National Electric Light Association, which also takes place at Atlantic City.

Personals

Harry M. St. John

We wish to announce the appointment of H. M. St. John, chief metallurgist of the Detroit Lubricator Company, Detroit, Mich., as metallurgical editor of THE METAL INDUSTRY, to succeed the late Jesse L. Jones.

Mr. St. John was born at Canajoharie, New York, in 1888. He received his chemical training at Cornell University, graduating in 1910 with the degree of A.B. From that date until 1913 he was a research chemist with the National Carbon Company at Cleveland, Ohio, leaving to become research engineer for the Commonwealth Edison Company, Chicago. During the war he was a captain in the Chemical Warfare Service, engaged in the manufacture of Lewisite at Willoughby, Ohio. In 1919 he became connected with the Detroit Electric Furnace Company, where he remained as service manager until 1923.

H. M. St. John

Mr. St. John is a member of the American Chemical Society, the American Electrochemical Society, the American Foundrymen's Association and the American Institute of Mining and Metallurgical Engineers. He is a member of numerous committees for these organizations and has contributed occasional papers to their transactions, as well as to the technical press. He is also a member of the Joint Committee on Foundry Refractories and chairman of its sub-committee on Non-Ferrous Survey.

Clark S. Judd has been elected vice-president of the American Brass Company, Waterbury, Conn.

Craig D. Munson, of the International Silver Company, Meriden, Conn., has been elected a member of the executive committee of that company.

John C. Pangborn, vice-president of the Pangborn Corporation, Hagerstown, Md., manufacturers of sand blast and dust collecting equipment, sailed on April 5 for an extended European tour with his family.

Evarts C. Stevens has been elected vice-president and a member of the executive committee of the International Silver Company, Meriden, Conn. Mr. Stevens will be in charge of manufacturing operations at all plants of the company.

Edwin P. Root, president of the New Haven Clock Company, New Haven, Conn., has resigned that position after 54 years of active service with the company. He was elected chairman of the company's board of directors. He is succeeded as president by **R. H. Whitehead,** formerly vice-president of the company.

President Herbert Hoover was presented with the John Fritz Gold Medal, the highest honor bestowed by the engineering profession in the United States, on April 25, at the White House, Washington, D. C. The award to President Hoover was made as an expression of appreciation of his high attainments as an engineer and for his great services to man.

H. L. Parr has announced his resignation from the position of general manager of the Burgess-Parr Company, Moline, Ill., manufacturers of special alloys, calorimeters, etc., and no immediate successor has been named. The company will continue its manufacturing operations and policies as hitherto. The concern is headed by **Prof. S. W. Parr,** president.

Paul E. McKinney has been appointed metallurgical engineer by the Bethlehem Steel Company, Bethlehem, Pa. He was formerly chemist and metallurgist for the United States Naval Gun Factory, Washington, D. C., where he was for many years in charge of foundry and forge production. He is widely known for his work in connection with high-strength bronze and steel castings and forgings.

Sam Tour, formerly metallurgist for the Doehler Die Casting Corporation, has been elected a vice-president and a director of Lucius Pitkin, Inc., 47 Fulton Street, New York City, analytical and consulting chemists and engineers. Mr. Tour's general consulting practice has been merged with that of the Pitkin company. The announcement was made as this issue went to press. A more complete statement will be contained in the next issue.

Obituaries

William G. Harris, Jr.

William G. Harris, Jr., vice-president of The Canada Metal Company, Ltd., The Graham Nail Works, and Canada Foils, Ltd., all of Toronto, Canada, died on March 28, 1929, after a short illness with pneumonia.

Mr. Harris was a widely known figure in the Canada metal industries. He started as a boy with his father, learning the business at the works of The Canada Metal Company, where his father was connected. He grew up with the company and became its vice-president, in which capacity he took active charge of the entire business for some years up to the time of his death. Besides his industrial connections, he was well known for his philanthropic activities.

William G. Harris, Jr.

Dr. Rudolph Breves

Dr. Rudolph Breves, president of the Waukegan Chemical Company, Waukegan, Ill., and widely known figure in the lacquer and metal finishing field, died on April 26, 1929, after a lingering illness.

Dr. Breves was born in Osterwald, Germany, December 23, 1867. He started as a pharmaceutical apprentice in Hanover, Germany, and later studied pharmacy in Vienna and Chicago. In line with his pharmaceutical work, he also studied chemistry in Berlin, Brunswick and Stuttgart in Germany and New York in this country. He formed a commercial connection as plant chemist for the Gelsenkirchen lacquer plant in Germany. He then became chemical assistant to the Central Station for Commerce and Trade at Stuttgart, Germany.

In 1899 he came to this country to be the chief chemist of the Egyptian Lacquer Manufacturing Company, New York. He retained this connection until 1915. He then became director of the analytical laboratories of the New Jersey College of Pharmacy at Newark. About this time he became chemical director of the Wilder Tanning Company of Chicago and Waukegan, Illinois. Due to change in management, he left the leather works and became chief chemist of the National Oil Products Company in Chicago. This connection he retained until the founding of the Waukegan Chemical Company in 1919. Doctor Breves was president of this company, manufacturing Brevolite lacquers until his death.

Many of the lacquer formulas in use today are the result of development work done by Dr. Breves. He was one of the most noted men in the field of both lacquer manufacturing and application, and he was recognized here and in Germany as an authority on these subjects. He held the following degrees: Ph.G., Ph.B., A.M., Ph.D.

He was married in 1914 to Erna Lippels, and is survived by his widow, two children, Ruth and Laurence, his brother, Harry Breves of Jersey City, New Jersey, and his sister, Alma.

Frank J. Newbury

Frank J. Newbury, 65 years old, long connected with the John A. Roebling's Company, Trenton, N. J., died on April 29, 1929, in Sinai Hospital, Baltimore, Md., after a protracted illness. He had been at the hospital for nearly two months.

Until January 1, 1928, Mr. Newbury was general manager of the insulated wire department of the Roebling Company, with which he had been identified for 38 years. —C. A. L.

Patrick H. Conley

Patrick H. Conley, a leader in the gold and silver refining industry and a founder of the firm of Conley and Straight in Providence, R. I., died at his home in that city on April 17, 1929, in his 65th year. He was born in Ireland on November 8, 1865, and came to this country as a youth of 17. With John A. Straight he entered the refining industry in 1896 and the business was incorporated in 1922 with Mr. Conley as president, Mr. Straight as treasurer, and George W. Conley, son of the deceased, as vice-president.

Mr. Conley developed new processes for purifying gold and silver. He was a student of chemistry as applied to his business and worked out many practical improvements by his aid. His readiness to assist young men just starting in business in the jewelry lines added to a popularity attested by his membership in many organizations. He was a member of the New England Manufacturing Jewelers' and Silversmiths' Association, the Manufacturing Jewelers' Board of Trade and the Providence Chamber of Commerce.

He is survived by two sons, two daughters, three grandchildren and three brothers.

—W. H. M.

Charles E. Carpenter

Charles E. Carpenter, president and general manager of E. F. Houghton & Company, Philadelphia, Pa., died of heart disease on April 6, 1929, at his home at Miami Beach, Florida. Mr. Carpenter was 67 years of age. He was well known in the field of industry and also as a lecturer and writer on economic, social and religious subjects. He was the author of many interesting and instructive editorials for his company's house organ, "The Houghton Line." He is said to have made over 1,200 addresses during his lifetime.

John F. Gannon

John F. Gannon, of Gannon and Scott, gold and silver refiners, 12 Calender Street, Providence, R. I., died on March 28, 1929, at his home, 133 Salisbury Avenue, that city, after an illness of about a month following a severe attack of influenza. He was born in Providence, April 18, 1868, and after attending the public schools entered the refinery business. About twelve years ago he formed the present partnership.

He leaves, besides his widow, three daughters, a son, four sisters and a brother. —W. H. M.

Harry F. Brinkerhoff

Harry F. Brinkerhoff, president of the Brinkerhoff Brass and Bronze Company, 57½ Dey street, New York City, died at his home in Brooklyn, N. Y., on March 22, 1929. Mr. Brinkerhoff was 73 years of age at the time of his death. He had been well known in the metal industries for many years and enjoyed a reputation for great integrity in his business.

F. D. Orben

F. D. Orben, owner of a job plating shop at 204 E. Main street, New Rochelle, N. Y., was killed together with his wife in an automobile accident March 29th. He was 42 years old. Mr. Orben was a brother of J. P. Orben, vice-president of the Daniels and Orben Company, New York City.

Harry P. Kent

Harry P. Kent of Attleboro, Mass., who retired some years ago from the manufacturing jewelry business in that city, died there on April 7, 1929. Mr. Kent was interested in various civic and financial enterprises. He is survived by his widow and a son.

News of the Industry

Industrial and Financial Events

Aluminum Company

The Aluminum Company of America, Pittsburgh, has issued a statement as of December 31st, 1928, showing earnings of $7.08 per share in 1928 as against $3.27 per share in 1927. Current assets were over $71,000,000; current liabilities $3,865,000.

Sales were slightly in excess of the amount of aluminum produced during 1928, although the production was twenty-eight per cent greater than during the previous year. No important changes in the prices of aluminum have occurred since the latter part of 1927. Demand and market conditions have been steady.

The new dam at Santeetlah, N. C., which is the second of the units in the development of the Little Tennessee River, was completed during the past year and the power derived from it is being utilized. Another dam is under construction at Calderwood, Tennessee, on the same river, and power from this dam will be available early in 1930. Extensive enlargements in the company's fabricating facilities have been undertaken during the year in order to meet existing or anticipated demands for fabricated aluminum.

On June 4, 1928, the foreign properties of the company (with the exception of the bauxite ore properties in Dutch Guiana, the large Chute a Caron Hydro-electric development on the Saguenay River in Quebec, the Cedar Rapids transmission line, and two or three minor and unrelated investments) were transferred to Aluminum, Ltd., a Canadian corporation, in exchange for its capital stock, and the stock so acquired was distributed to the stockholders of Aluminum Company of America. This distribution resulted in a reduction in the surplus as of December 31, 1928.

The consumption of aluminum during 1928 in the United States was substantially greater and the diversification of its uses was wider than in the past few years, and the indications are that progress both in consumption and diversification will continue.

Hearing on Scrap Aluminum Supplies

Alleged monopolistic practices of the Aluminum Company of America in regard to supplies of scrap aluminum were investigated at a hearing at the New York offices of the Aluminum Company, 230 Park Avenue, on April 22. Further hearings are to be held in Chicago on May 6.

The hearing in New York brought forth testimony from several sources, including representatives of trade journals, manufacturing concerns and scrap dealers, among whom were E. G. Jarvis, president of the Niagara Falls Smelting and Refining Company, Samuel Greenfield, president of Samuel Greenfield and Company, scrap metal dealers, E. K. Brown of the staff of the "American Metal Market" and Joseph Zimmerman of "The Daily Metal Reporter." In testifying, Mr. Brown stated that during the five years he has been in constant touch with the scrap aluminum market he has not observed anything which indicated that the Aluminum Company was in a controlling position in the market, or that would lead to the belief that the company could or wanted to monopolize the market.

The charges brought against the company are that by offering prices higher that those paid for new metal, the company has tried to control the supplies of scrap material. The testimony of witnesses at the hearing, however, tended to disprove this.

To Produce Aluminum in Virginia

Production of virgin aluminum at Salem, Virginia, is planned by the International Silica Corporation there, recently organized under Virginia laws with authorized capital of $200,000, according to an announcement by T. O. McAdoo, president of the concern. Output is expected to start in the fall of this year, with initial rate of 10 to 12 tons daily, which will later be increased to 25 tons daily, of virgin ingot of over 99 per cent purity, it is stated. A pilot plant at Salem is now in operation, producing a ton of aluminum oxide a day, and work will start soon on a new plant at Newmarket, Va., which will handle about 50 tons of alumina daily. Maximum capacity of the Salem plant is said to be 10 tons daily. Aluminum silicate obtainable in the neighborhood of Salem is being used for production of the oxide.

May Buy Randolph-Clowes Company

A report that the American Brass Company is to acquire the Randolph-Clowes Company, one of the oldest casting and rolling shops in Waterbury, Conn., is not denied by the officials of either company, although at the same time they will not actually confirm it. President John A. Coe of the American Brass Company and President Ralph H. Smith of the Randolph-Clowes Company merely said they would neither affirm nor deny the report. It was admitted that some sort of negotiations have been in progress between the two concerns and it is expected some sort of an agreement will be arrived at within a few weeks. It is learned that the American Brass Company recently loaned experts to the other company when its boilers failed to function.

The Randolph-Clowes plant, while one of the oldest in Waterbury, has changed hands several times. It was originally known as Brown and Elton and later as Brown Brothers. While it has not expanded as rapidly as have the other brass concerns of the city, it has a high reputation for quality products. It makes a specialty of large brass tubes and is understood to make tubes of the largest size of any brass plant. —W. R. B.

Anaconda Copper Mining Company

Net income of the Anaconda Copper Mining Company and subsidiary companies in 1928 amounted to $39,841,187, after all deductions, including Federal taxes. This compares with $10,121,142 for 1927.

Last year's business, as well as earnings, established a record for the company, the result of an extraordinary increase in consumption which developed in the second quarter and continuel throughout the rest of the year. The total income was $291,199,087, against $200,538,653 in the year before. The net income from operations last year was $26,106,228, while the income from investments and marketable securities amounted to $13,734,958.

The increase in the income, the report says, was due both to increased copper prices and to the expansion of operations.

The report reveals that Anaconda paid $4,456,824 for all of the mining, milling and lumber interests of the heirs of the late Senator William A. Clark, together with the Butte Electric Railway Company and the Montana Hardware Company.

Jonathan Bartley Crucible Company

Jonathan Bartley Crucible Company, Trenton, N. J., has changed its firm name to the Bartley Crucible and Refractories Company. This change was made because of the increased growth of the refractory business of this company, consisting of the manufacture of refractories for high temperature and severe conditions. There is absolutely no truth in the rumor that has been circulated that they are retiring entirely from the crucible manufacturing business. Lewis H. Lawton, president, has purchased the majority of the stock of the company, the former board of directors having been retired and an entirely new board elected.

Many new improvements have been made in plant equipment and methods. The company has been experimenting with the manufacture of a new crucible to meet present day melting conditions. These experiments have been highly successful and the company is now producing a crucible which gives an unusually fine service under severe tests, it is stated.

Reliance Bronze and Steel Corporation

Reliance Bronze and Steel Corporation has been incorporated under New York laws and will take over the Reliance Fireproof Door Company, Brooklyn, N. Y., the United Pressed Steel Products Corporation, College Point, L. I., and Knoburn Products Corporation, Hoboken, N. J. These companies and firms to whose business they succeeded at various times, have been in business for about 20 years, manufacturing various types of metal doors, architectural brass and bronze work and other articles. The con-

solidation will eliminate duplication of activity and make for economy of operation.

The new corporation has just issued $1,000,000 in 15-year convertible 6 per cent sinking fund debentures, as well as an issue of common stock.

American Electro Metal Corporation

The American Electro Metal Corporation which recently decided to locate a plant at Lewiston, Me., as announced in a previous issue, has chosen five men for training in Austria, where the men at the head of the company, and who decided to put an American plant at Lewiston, will give the five a complete course that will fit them for executive positions at Lewiston. The plant, which combines a rolling mill and plating and polishing departments, is not yet in operation but is nearing completion. Jack Strauss, vice-president, is in charge at present. The five who were selected are Laurence B. Martin, Lester D. Hayes, Adolf Schulze, Dana Winslow, of Auburn, Me., and J. Willard Brown, of Lewiston. They will spend about three months in Austria.

Walker M. Levett Company

Walker M. Levett Company, New York City, has sold the brass foundry and aluminum piston departments of its business to the Plainfield Manufacturing Company, a subsidiary of the Spicer Manufacturing Company. The Levett company's ball and roller bearing retainer business has not been sold under this arrangement and will be sold separately or continued by the Levett company. The price reported to have been paid by the Plainfield company was $76,033. It was stated that disposition was found necessary because the company lacked capital to take care of expansion of its business and that its customers could not be held unless their growing requirements were supplied.

Weaver Brothers Company

Weaver Brothers Company, manufacturers of metal cleaning equipment and other apparatus, which recently removed from Clinton to Adrian, Michigan, is practically on a regular production basis at its new plant. The company plans to expand its line of products now that it has more ample manufacturing space, one of the first innovations planned being an experimental nickel plating department. Certain of its products which have hitherto been made outside for the company will now be completely produced in the firm's plant.

Republic Brass Corporation

The Republic Brass Corporation, New York, reports for the six months ended December 31, 1928, net profit of $2,050,108 after interest, Federal taxes, etc., equivalent after allowing for dividend requirements on 7 per cent. preferred stock and $2.50 no par class A stock to $2.36 a share earned on 507,841 no par shares of common stock. Net profit for the year 1928 was $3,899,570, equal to $4.33 a share on the common stock after preferred and class A dividends.

Non-Ferrous Ingot Orders

On April 1, unfilled orders for brass and bronze ingots and billets on the books of the members of the Non-Ferrous Ingot Metal Institute amounted to a total of 22,755 net tons, according to an announcement of the Institute issued today.

While these and other statistics will be given publicity regularly in the future, the facilities for gathering such data are of recent origin. Accordingly, there are no statistics available as yet for comparison with previous corresponding periods.

International Silver Company

The International Silver Company and subsidiary report for the first quarter of this year a net income of $268,819 after depreciation, interest and federal taxes, equivalent after allowing for 7 per cent preferred dividends to $1.79 a share earned on 91,200 common shares. This compares with net income of $236,018 in the first quarter of last year, equivalent to $1.43 a common share.

Bandits Seize Bar Gold Near Smelter

Four armed and masked bandits held up two messengers of the Irvington Smelting and Refining Company, Irvington, N. J., early in April and robbed them of two bags containing 900 ounces of gold in bars, valued in all at $18,000. The gold was being taken to the United States Assay Office in New York City, and the men were within a block of the plant when held up by the four men who leaped from an automobile, covered them with pistols, seized the bags, driving away in the car after marching the messengers into an alley and warning them not to follow.

It is believed the men were familiar with the plant's activities. Officials of the company said it was not unusual to have small amounts of gold moved without guards. The loss was covered by insurance.

Zinc Research and Market Campaign

The American Zinc Institute, official organization of the zinc producers of the United States, is contemplating a plan for a research and market broadening campaign, with a view to increasing consumption of zinc by making known its various uses and by aiding potential consumers to adapt zinc to their requirements. At the last meeting of the Institute, held at St. Louis on April 16, a resolution was passed authorizing the president, Ralph M. Roosevelt, to appoint a committee to formulate a plan which will be submitted to all domestic zinc producing companies. It is desired to learn whether or not such companies are willing to carry on the work of the campaign for some years.

Evans-Wallower Lead Company

Net operating income of the Evans-Wallower Lead Company in the first quarter, after depreciation, but before depletion, totaled $158,896, compared with $80,281 in the corresponding period last year.

The company announces that its new electrolytic zinc plant being constructed at East St. Louis will be completed and ready for operation by June 1.

The Tainton Process for the manufacture of electrolytic zinc, to which the Evans-Wallower Lead Company holds exclusive rights in most sections of the United States, has just been acquired by the Giesche Company, one of the largest producers of zinc in Germany.

Bohn Aluminum and Brass Company

The report of the Bohn Aluminum and Brass Company, Detroit, Mich., for the first quarter of 1929, shows a net profit of $1,019,253, after depreciation, Federal taxes and other charges, equivalent to $2.91 a share earned on 350,489 shares of stock outstanding. This compares with $818,091, or $2.34 a share in the corresponding quarter of 1928. Sales for the first quarter of the current year aggregated $10,306,882, against $8,538,521 a year previously.

Self-Winding Watch Produced

A new type of timepiece, hailed as the latest "near perpetual motion machine," has been placed on the market. The watch has a mechanism which winds the watch by the vibration it receives from being worn on the wrist. A company to be known as the Perpetual Self-Winding Watch Corporation has been formed with cash capital of $800,000, to manufacture the watches.

Russian Aluminum Plants

Negotiations which have been carried on during the past two years between Dr. Robert J. Anderson and the Soviet Government relative to construction of an aluminum-reduction works in Russia have come to an end. The parties to the negotiations were unable to agree to terms and details of carrying out the project.

Plans called for the design and erection of a works to produce about 10,000 tons of aluminum per annum, together with an alumina plant and carbon-electrode factory. Power was to be

supplied from the Dnieperstroy hydro-electric plant, now under construction. Russian bauxite was to be used as the ore. A special process had been developed to treat this bauxite for the preparation of alumina. Plans were also in hand for the design and erection of rolling mills and other plants for the fabrication of aluminum and its alloys.

Dr. Anderson spent several months in Soviet Russia in the summer of 1928 studying the problems involved in founding an aluminum industry for the country and discussing the general situation there with officials of the government.

New Cable and Wire Plant

A large force of workmen, under the supervision of The H. K. Ferguson Company of Cleveland, is completing preparation of the 153 acre site for the construction of The Western Electric Company's $25,000,000 cable and insulated wire plant to be built at Point Breeze, Md. The old Baltland Distillery, which stood on the site to be occupied by the cable plant, is being torn down rapidly, and materials are arriving in large quantities and are being prepared for use in the construction of the cable plant that is to be the first unit of the huge development at Point Breeze. This building is to be 500 feet by 660 feet.

New Companies

The Chromium Plating Company, Cedar Avenue and Ashland Road, Cleveland, Ohio, has been formed by **W. H. Chandler** and **C. S. Morgan,** to carry on a chromium plating business under a license from the **Permachrome Process Corporation,** an Ohio concern, which has applied for patents on a process for electroplating aluminum with chromium. Mr. Chandler states that recent press statements that the firm had some connection with the Chandler Motor Car Company are unfounded. In regard to the new process mentioned, he states that its advantage lies in the fact that aluminum can be plated directly, without any intermediate plate between the aluminum and the chromium. The plate produced, he states, has been found to withstand thorough weather and abrasive tests remarkably well.

Manufacturers Finishing Company, Waterbury, Conn., has been incorporated under Connecticut laws, to engage in manufacture of brass, copper and steel products and to carry on a business in electroplating, japanning, zincing, tinning, buffing, polishing and allied lines of work. The incorporators are **J. F. O'Neill, E. V. O'Neill** and **R. C. Frost.** Company has leased quarters at 152 North Elm Street, Waterbury.

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Conn.

MAY 1, 1929.

Local factories report the largest volume of orders and record employment for recent years. "Business for the past nine months has been exceptionally good," according to an official of the **American Brass Company.** "We have from 3 to 60 days' business ahead on our books and we are employing more people than ever in our history not excepting the war period."

Business of the **Scovill Manufacturing Company** is in a very satisfactory condition with respect to releases from the trade, according to an official of that company. "For the second quarter of this year inquiry is active for goods and material to be delivered in the third quarter. Volume of releases, however, will greatly depend upon the final adjustment and it is not possible to forecast at the moment, the trend for the period beyond July 1st. Enough, however, is known to give us confidence that industries in Waterbury will be fairly active throughout the year," he states.

"So far as we know, business conditions in Waterbury are good," according to **Frederick S. Chase,** president of the **Chase Companies, Inc.** "The general volume of business throughout the country continues strong and with the reduction in the price of copper to a reasonable figure, I do not see why we cannot look forward to a continuation of sound business in this territory. The recent deflation in the price of copper is in our judgment distinctly helpful to the brass business in general. If copper were to continue at the 24 cent price for any length of time it would unquestionably result in the introduction of temporary substitutes for it and for copper alloys, notably brass. This in turn would reduce the volume of business of Waterbury's principal industry, that of making and cutting up into various forms, brass, bronze and other copper alloys."

Employment in Waterbury in the eight largest factories for last month reached 19,951, the largest figure at any time since 1920. The total number in the 46 largest concerns, employing 100 or more, totalled 35,481, an increase of 132 compared to the previous month. The increase in the eight largest concerns was 65 compared to the previous month and 1,685 compared to the same month in 1928.

Incorporation papers have been filed by the **Manufacturers Finishing Company., Inc.,** capital stock being set at $50,000. It will engage in electroplating and the manufacture of small brass goods. The sum of $2,000 has been paid in; it has 2,000 shares of common stock of $25 par value. The incorporators are Joseph F. O'Neill, Eugene O'Neill and Robert C. Frost. The place of business is 29 Jefferson Street.

Malcolm J. Ford, secretary of the **Waterbury Fastener Company,** has denied reports that work at the plant will be indefinitely discontinued in spite of reports that the employees have been given notice that their services will not be required after May 1. A merger is expected between this company and the **United States Fastener Company** of Boston, but Mr. Ford states that it has not yet been completed. Even on its completion, he says, the novelty manufacturing department will be retained at the local plant. He states, however, that the fastener making branch of the plant will be moved to Boston. The rest of the factory will be devoted to manufacture of hand bag frames. There are about 100 people employed at the factory at the present time.

The decision of the **United States Supreme Court** preventing the **Interborough Rapid Transit Company** of New York from increasing fares to 7 cents will not interfere with the orders local concerns received some months ago for 7 cent tokens; the orders were filled and delivered some time ago. The **Scovill Manufacturing Company** is understood to have made about 5,000,000 and the **Waterbury Button Company** about 2,000,000 tokens for the traction concern. Other concerns in the Naugatuck Valley are said to have made and delivered 7 cent tokens to the transit company which had ordered them in anticipation of obtaining a favorable decision. Incidentally, the **Waterbury Button Company,** it is learned, in addition to its business of making buttons and tokens, has built up a considerable business in recent years in metal toys, metal and bakelite radio parts and novelties other than buttons.

The Sterling Stop Watch Company has increased its capital stock by the authorization of 1,000 shares of preferred stock with a par value of $25 a share and by authorization of the increase of the number of common stock shares without par value from 2,500 to 3,500. All the shares have been subscribed for, it is stated.

Herbert S. Rowland, former head of **Berbecker and Rowland Manufacturing Company,** left an estate of $370,694, according to the inventory filed with the judge of probate here last month. It is to be divided equally among the members of his family. Among his holdings were: 2,735 shares of **Beardsley and Wolcott Manufacturing Company,** which recently acquired the **Berbecker and Rowland Company,** valued at $92,990; 50 shares of **Blake and Johnson Manufacturing Co.,**

valued at $10,000 and 375 shares of the **American Hardware Company,** of New Britain, valued at $27,000.

A talk on "The Properties of Metal" was given by **John Bradley,** metallurgist of the **American Brass Company,** at the mid-monthly meeting of the local Rotary Club in April. He explained the properties of the atoms and electrons in metals and made several demonstrations with the instruments.

Statistics compiled by the **Copper and Brass Research Association** show that sales of brass pipe reached the total of 76,777,400 pounds in 1928, or almost five times the poundage for 1922 and 14,000,000 pounds above the 1927 total.

Carleton Bristol has received a patent on a compensated absolute-pressure gauge and has assigned it to the **Bristol Company.**

E. O. Goss, president of the **Scovill Manufacturing Company,** has been re-elected a director of the **New York, New Haven and Hartford Railroad Company.**

Purchasing agents of the local factories attended the meeting of the **Purchasing Agents' Association of Connecticut** in Hartford on April 19th to hear **Dr. Lewis Hanney** of New York University speak on "The Copper Situation." They also took part in the informal discussion on "At What Price Will the Metal Be Stabilized?"

Walter Abel has been given a patent on a tack button which he has assigned to the **Patent Button Company.**

W. R. B.

Connecticut Notes

MAY 1, 1929.

NEW BRITAIN—Maurice G. Steele and **Edward S. Twitchell** were added to the directors of the **Hart and Hutchinson Manufacturing Company** at its annual meeting last month. The former is sales engineer and the latter is sales manager.

The Hart and Cooley Manufacturing Co. has transferred to the **Hart and Hutchinson Company,** with which it is affiliated, the greater part of its plant and adjoining property. The former company intends to center its activities in Holland, Mich., and Nashau, N. H., where it has recently acquired plants. **Vice-president Reuben C. Twitchell** of Hart and Cooley signed the papers recording the transfer. Both concerns manufacture heating registers, radiator sheathes and similar articles.

Charles B. Parsons, first vice-president of the **American Hardware Corporation, Charles F. Smith,** chairman of the board of **Landers, Frary and Clark,** and heads of other local factories appeared before the legislature last month to protest against the proposed bill permitting Hartford to develop reservoirs in Barkhamsted which would interfere with the water rights of the local concerns.

BRIDGEPORT—Alfred A. St. John, president of the **New England Manufacturing Company,** announces that his company has taken over the factory building and equipment of the **Eagle Tool and Machine Company** on Nichols avenue. Various automobile accessories will be manufactured.

The report of **Remington Arms Company** for 1928 shows a consolidated net profit of $1,887,264 after depreciation, interest and federal taxes. The earnings were the largest since 1918, almost three times those for 1927, and more than five times 1926.

HARTFORD—Net profits of the **Standard Screw Company** for 1928, after making provision for depreciation and federal taxes, were $1,042,448. Much new equipment was added during the year and most departments are now on double shift.

The directors of **Arrow-Hart and Hegeman** have voted to increase the dividend rate from $1.60 to $2 a year. The new rate was applied to the dividend paid in April. The net earnings for 1928 were $1,253,252 compared with $875,000 for 1927.

BRISTOL—The new addition of the **New Departure Manufacturing Company** has been finished and machinery is now being installed. Manufacturing operations in the addition will be started this month.

The officials of the **E. Ingraham Company** say that the six-story addition now being erected will be completed by June and will be operating by July.

Henry Komiserak, an employee of the **Bristol Brass Company** was killed at his work on April 9, when the beam supporting the cab of the crane he was operating crashed to the floor carrying the cab with it.

MERIDEN—The International Silver Company has been sued by the **United Chromium Company** of New York for an alleged infringement of a patent; an injunction and accounting are asked for. The New York concern claims the sole right to a patent granted to **Colin Fink,** said to be the inventor of an electro-depositing chromium process, and alleges that the local company has been using the process without permission. The local company, in its answer, sets up that the patent office in Washington failed to investigate properly the claims of Mr. Fink in applying for a patent and claims that he "deliberately and fraudulently" omitted to set forth the essential matters necessary for the performance of the process but included "false and misleading statements."

THOMASTON—Approval has been given by the legislature of the bill amending the charter of the **Seth Thomas Clock Company** and increasing its capital stock from $1,000,000 to $2,500,000, to be divided into preferred and common stock as the stockholders by a two-thirds vote may determine. The four-story wooden factory which has been vacant since the new addition was erected is being torn down.

STAMFORD—Yale and Towne Manufacturing Company, for the first time in its history has furnished its stockholders with an earnings statement. The net sales for 1928 amounted to $17,555,261; net profits, $2,152,631; net profits for 192 $1,939,751. The surplus is now $11,539,652 as compared with $9,700,611 the previous year.

SOUTHINGTON—Joseph G. Wood has been appointed trustee of the bankrupt **Walker-Stewart Foundry Company.** Referee Saul Berman has ordered a sale of the assets following the completion of the audit and appraisal now being made.

WINSTED—Polymet Manufacturing Company of New York has acquired the **Strand and Sweet Manufacturing Company,** involving a payment of about $250,000. The payment will be part cash and part stock in the purchasing company. The local concern has been operating continuously day and night since it was started a year ago. It turns out 30,000,000 feet of fine magnet wire for radio and automotive use daily. Most of the work is by automatic machinery, the plant employing about 80 people. The local management of the plant will continue. Further expansion of the plant will be made as a result of the sale.

NEW HAVEN—The Western Electric Company has ordered four new wire machines from the **Wire Machinery Company** of this city, at an estimated cost of over $500,000. They will weigh more than 1,300,000 pounds and will take a year and a half to build.

The Acme Wire Company has declared a dividend of $2 a share, payable May 1 to stock of record April 16.

W. R. B.

Providence, R. I.

MAY 1, 1929.

April industrial conditions in all lines of metal work experienced a general stimulation that was only partially checked by the unusually adverse weather, with rain or snow some seventeen days out of the month, which somewhat interfered with outdoor work. As a whole, the metal working establishments were considerably busier than in any month this year and in some lines a shortage of skilled metal workers has been noticeable, such as tool and die makers in the jewelry lines, machinists and machine operators. An upward trend in production and employment is reported from a majority of the metal working plants, all the building lines showing decided improvement and jewelry manufacturing and allied branches commencing the annual spring activity.

The Ostby and Barton Company, manufacturing jewelers, is celebrating its fiftieth anniversary this spring and preliminary plans for its fitting observance were discussed but no definite action taken at the annual meeting of the concern held at the offices, 100 Richmond Street, recently. **Harold W. Ostby** was re-elected president and **Erling C. Ostby,** treasurer. These officers, with **Arthur O. Ostby,** constitute the directorate.

H. A. Greene and Company, Inc., of Providence has been incorporated under the laws of Rhode Island to conduct a manufacturing jewelry business with authorized capital of $0

shares of common stock of no par value. The incorporators are **Max Silverman, Harry A. Greene** and **Samuel H. Workman.**

The annual meeting of the stockholders of the **Gorham Manufacturing Company** was held at the offices at Elmwood last month; all of the officers were re-elected, with the exception of **H. B. Kelly,** who was added to take the place of a recently deceased member. Stock dividends were approved as voted at a previous meeting.

The **Kestenman Brothers Manufacturing Company** has taken the other half of the fourth floor where its plant is located at 150 Chestnut street, thus doubling its factory space.

Getchell and Son, Inc., of Woonsocket has been chartered to deal in sheet metal goods in that city. Authorized capital consists of 24 shares of common no par value stock. The incorporators are: **H. E. Getchell,** 205 Prospect street, Woonsocket; **A. M. Robinson, Leo A. Robinson** and **B. G. Robinson.**

Permission has been granted the **United States Chemical Products Company** to erect a lead reclaiming plant on Smith street, Pawtucket. This corporation has a large plant in New Jersey and contemplated erecting a large unit in Pawtucket, but residents in the vicinity of the proposed site raised strenuous objections which were finally disallowed by the zoning board of review. **John C. Culbert** of South Attleboro, general manager of the **Pawtucket Melting and Refining Company,** with a plant at Central Falls, is a director in the new corporation.

The National Auto Metal Works has removed its plant from 318 Pine street, Providence, to 32 Spring street, corner of Broad street, where it has considerably larger quarters. Facilities have also been added for doing sheet metal work of every description.

The Langelier Manufacturing Company of Providence has recently made several important improvements in the construction, operation and adaptability in its multiple-spindle continuous drilling machine. The drilling spindle driving mechanism has been reconstructed so that different drilling speeds can be easily obtained by interchangeable pick-off gears, which are totally enclosed, hardened and run in oil. The drilling spindle units have been made separate so that the machine may be arranged with six, eight or ten working stations. The workable feed slides have been changed from a round to a rectangular form to keep them rigidly in position while feeding. Among other improvements is a new form of chip guard. The unit occupies a floor space of 71 by 74 inches and stands 9 feet 6 inches high, weighing about 13,000 pounds.

Fire early in the morning of April 15 destroyed the interior of the plant of **the Rhode Island Nickel Plating Company** and caused considerable damage by smoke and water to the other occupants of the Kescot building, corner of Friendship and Garnet streets, Providence. Firemen responding to th alarm found the flames had consumed most of the woodwork and fixtures in the plant which belongs to **Nels G. Berkander** on the second floor of the building. The rest of the building is occupied by jewelry manufacturing and allied concerns.

The Ceco Manufacturing Company has just broken ground for a four-story addition to its new factory building at 1200 Eddy street, Providence. According to a statement made by **Ernest Kauer,** president, the new building will be of concrete and will contain latest developments in factory design. This addition will cover approximately 60,000 square feet of floor space and will be devoted to engineering research in the manufacture of radio tubes. It will contain an equipment division fitted with the last word in motor-driven machines, tools and appliances. Up-to-date cafeteria and recreation rooms will be provided for employes. This new addition, which will cost upward of a quarter of a million dollars, will be ready for occupancy by July 1, it is planned.—W. H. M.

Middle Atlantic States

Newark, N. J.

MAY 1, 1929.

The Sirian Lamp Company has purchased the factory property at Sherman avenue and Clifton street. **The Sirian Wire and Contact Company,** a subsidiary of the purchaser, **Arcturus Radio Tube Company,** which has extensive manufacturing facilities in that vicinity, will take possession of the plant at once. The Wire and Contact Company produces molybdenum wire in large quantities for manufactures of lamps and radio tubes. The radio tube company builds alternating current radio tubes both for national retail distribution and original equipment in nationally known radio sets. The Sirian Lamp Company's new property is on a plot 200 by 225 feet. The buildings include two three-story and basement brick factories and a large one-story metal warehouse. The buildings contain 79,000 square feet of floor area. The Arcturus Company recently purchased a factory building at 708 Frelinghuysen avenue. **Charles H. Braselton** is president of all these companies.

The Majestic Electric Manufacturing Corporation, makers of radio tubes, have leased for a term of years space in the building at 227-29 High street. The company has been compelled to increase its output.

The interior of the plant of the **Spicer Manufacturing Company,** South Plainfield, N. J., will not be closed permanently. The company began to move machinery away several months ago. It is believed that new machinery will be moved in and set up.

The following new concerns located in Newark have been incorporated: **Newark Metal Products Company, Inc.,** metal products; $125,000. **Crown Manufacturing Company;** manufacture watch cases; $100,000. **Hesse and Hinton Chemical Corporation;** manufacture chemical; $25,000. **Lincoln Watch Case Company;** 5,000 shares common; manufacture watch cases. **Silver Diamond Corporation;** $100,000; manufacture jewelry. **Majestic Cabinet Company, Inc.;** 500 shares; manufacture metal radiator covers. **Saxon Radio Tube Company;** $100,000; manufacture radio tubes. C. A. L.

Trenton, N. J.

MAY 1, 1929.

Trenton metal manufacturing plants are reported to be doing nicely at the present time and are not looking for any slump in business for some time.

The Jordan L. Mott Company continues to operate five and a half days a week.

William R. Thropp Sons' Company is offering several cash prizes to students of the **Trenton School of Industrial Art** who complete the best pieces of work in the various classes of machine shop practice.

Robert C. Roebling, manager of the **John A. Roebling's Sons Company,** is one of the delegates to represent Trenton Council, Boy Scouts of America, at the annual Scout convention to be held in New York the latter part of may. Mr. Roebling has always taken an active part in the Boy Scout work and last season turned over one of his boats to the organization so that the boys might get practice in seamanship.

A huge addition will be built to the plant of the **Keystone Aircraft Corporation** at Bristol, Pa. It will be 250 feet long, 100 feet wide and of fireproof construction. The estimated cost of the addition is $250,000. Increasing business at the Keystone plant has made the big addition necessary. The assembling department in particular has been cramped for space. The corporation has a government order for bombing planes that will keep it busy for a year and a half, and besides it is busy making planes for other concerns.

John A. Roebling's Sons Company has received the contract to build part of the great seadrome to be anchored in the Atlantic Ocean between **New York and Bermuda.** Cables drums and anchors are to be made by the Roebling company. The seadrome is to cost $1,500,000 and will be constructed at Cape Hatteras and towed 300 miles out to sea. It will be 400 feet wide and 200 feet in length.

The following concerns have been newly incorporated here: **Wilders Service and Supply Company,** Hoboken, $50,000, welding. **Somerset Chemical Company,** Bernardsville, N. J.; $125,000; chemicals. **Atlantic Iron and Metal Company,** At-

lantic City; metallic compounds; $125,000. **Lincoln Chinalite Company, Inc.,** Trenton; manufacture lighting devices; $125,000. **Unique Metal Novelty Manufacturing Company, Inc.;** metal goods; North Bergen; fifteen shares no par. **Majestic Cabinet Company, Inc.,** Newark; metal radiator cabinets; 500 shares no par. **Boynton and Yereance, Inc.,** manufacture chemicals, Rahway; 2,500 shares no par. **United States Mechanical Laboratories,** Hackensack; manufacture chemicals; $25,000. **Parisian Novelty Company, Inc.,** Bayonne; manufacture jewelry and novelties; $50,000. —C. A. L.

Middle Western States

Detroit, Mich.

MAY 1, 1929.

Practically all plants engaged in the non-ferrous industries are operating at capacity. The motor car industry, of course, is the greatest sustaining force and the outlook is encouraging. The airplane plants and the refrigeration plants are displaying more activity this spring than ever before and are also becoming great factors in the demand for metal products. The motor boat industry, not only in Detroit but throughout the state, is rapidly coming to the fore in the consumption of metals. These plants have been extremely active during the early spring and still are on heavy production schedules. The manufacture of plumbing supplies, owing to the depressed condition in the building field, is not as active as it had been. However, most of the plants in this line also are engaged in other and more active work and consequently are not vitally affected.

The plating industry is making rapid progress and the outlook for the future is good.

Unfilled orders of **Copeland Products, Inc.,** manufacturers of electric refrigerators, as of April 1, were three times as great as at the same date a year ago, according to **W. D. McElhinny,** vice-president. Shipments during March were approximately 50 per cent greater than for the same period last year and the April schedule has been increased 63 per cent over the April, 1928, schedule. The plant is now operating day and night.

The Schoewe Foundry, 1488 Catherine street, was recently incorporated. It is engaged in the manufacture of aluminum and brass castings.

Edwin N. Hartwick, secretary of the **Warner Aircraft Corporation,** announces that the organization's new factory is making rapid progress and probably will be in production about May 1. It is located on the Town Line road, near the Eight Mile road. The plant will have a production capacity of ten motors daily, it is stated.

The Stinson Aircraft Corporation's new plant now under construction at Wayne, Mich., will soon be fully equipped with machinery which has been in process of installation for a considerable time. The new structure has a floor space of approximately 85,000 square feet.

"With every department at top speed and with most departments working overtime, an unusually big year for our business is indicated," announces **Charles B. Bohn,** president of the **Bohn Aluminum and Brass Corporation.** "Only last January we started to produce aluminum extrusion for automobile body construction," he says. "So rapidly has this business developed that in four months we have been forced to expand this department. Work is starting immediately on a new aluminum extrusion plant which will cost $250,000. In addition, the initial equipment for this new building will cost more than $100,000. This new plant will be 120 by 300 feet long. Some idea of the rapid growth of our extrusion division can be gained from the following figures: In January we shipped 60,000 pounds; February, 120,000; March, 420,000; and April looks like 600,000." At the annual meeting of the Bohn organization the directors were all re-elected. **S. D. Denuyl,** was chosen secretary, succeeding **A. P. Lauer,** who remains as a director. The other officers were re-elected.

A bronze door designed especially by **Leonard Willeke,** architect, for the home of **Edsel Ford** in Detroit is attracting much attention from craftsmen not only in New York where it was executed, but also in Detroit. It took highly skilled craftsmen six months to complete this portal which critics declare is one of the finest examples of its type. During its construction it was necessary for the craftsmen to apply heat continuously to localized areas in order to have the metal of all the intricate parts malleable enough for beating and molding. The metal value was but a small part of the cost of the finished masterpiece. For some time bronze has been used for stairways, balconies and grille work in banks and public buildings, but its introduction into private homes is considered somewhat of a novelty.

The name of the **Metallurgical and Chemical Corporation** has recently been changed to **Manufacturers' Chemical Corporation.**

Nicholl-Hale Chrome Service, Inc., 1834 Garfield avenue, was recently incorporated. The capital stock is $50,000. It is engaged in electroplating. The stockholders are **Victor J. Nicholl, P. P. Hale** and **J. A. Nicholl,** all of Detroit.

The Northern Electrotype Company, 41 Burroughs avenue, was recently incorporated with capital stock of $100,000. It manufactures electrotypes.

Production of one plane a day, as compared with 51 for all of last year, is the schedule just laid down for the airplane manufacturing division of the **Ford Motor Company,** according to a recent statement from **Edsel Ford,** president. The output at present is three planes a week. —F. J. H.

Toledo, Ohio

MAY 1, 1929.

The brass, copper, aluminum and plating plants are all under heavy production, with a bright outlook for weeks ahead. Many plating plants which are adjuncts to concerns engaged in various lines of work are now operating at capacity.

The Toledo Scale Company recently purchased an 80-acre tract of land at Telegraph and Laskey Roads upon which it will erect a new plant, to be ready for occupancy about January 1, 1930. The deal involves about $500,000, according to **W. C. Goodkin,** vice-president. The building will be a radical departure from the usual manufacturing plant. It will have a floor space of 250,000 square feet and is to be of modernistic design. "Beauty in Industry" will be the company's watchword in planning the building and its surroundings, it is declared.

Aluminum Industries, Inc., Cincinnati, announces the purchase of the **Diamond Motor Parts Company,** St. Cloud, Minn. The Diamond Company is a large producer of replacement parts. Products of the St. Cloud plant will be marketed under the name of the "Permite-Diamond" line. **Aluminum Industries, Inc.,** now supplies the automotive and air craft industries with the new "Permite Unitype" piston.

—F. J. H.

Cleveland, Ohio

MAY 1, 1929.

The non-ferrous industries in this area are fully engaged in practically every line. The same also is true as to plating plants. The plating business is an accessory to so many varied lines that it is nearly always active. The outlook for new business was never better. Plating plants, of course, are largely sustained by the motor car industry. But there are other lines that are crowding closely and the plating business can not help but progress and make a better showing during the next few months than it has ever before.

A half million dollar order for airplane engine valves, covering the entire requirements of the **Wright Aeronautical Corporation,** at Patterson, N. J., for the balance of the year, has been received by **Thompson Products, Inc.,** Cleveland. The

valves are for Wright Motors using from five to nine cylinders and ranging in horsepower from 150 to 525. The stems of the exhaust valves are hollow to gain light weight—a type perfected by Thompson Products. Delivery of the valves will begin within 30 days.

The **Great Lakes Air Corporation,** formerly the **Glen Martin Company,** of which **William R. Wilson** is chairman of the board, let a contract recently to the **American Cirrus Engines,** Inc., for 1,950 airplane motors to cost approximately $3,000,000. The Great Lakes organization plans to produce 1,000 or more planes between now and the end of the year.

The **Foote-Burt Company** announces that it is about to start production on a newly perfected broaching machine. The new model combines the operation of three machines into one and has been developed to a practical basis after more than two years of experiment. —F. J. H.

Illinois Notes

MAY 1, 1929.

The Empire Metal Products Company, a new Chicago concern doing a galvanizing business and manufacturing and selling metal products, has purchased a plant in Cicero, Ill. Some $200,000 will be spent in remodeling and equipping the plant. **W. R. Pounder** is president of the metal company and **Walter H. Eckert** is secretary.

The Eckert Metalizing Products Corporation has been incorporated in Chicago with a capital of $5,000 for the purpose of dealing in metals of all kinds. Signers of the articles of incorporation are **B. O. Cobb, George Ecker, H. C. Spoden.**

Plans are being drawn up for the erection of two buildings by **H. Kramer and Company,** metal refiners, at a cost of over $100,000. One of the buildings will be used for unloading metals and the other will be used to house machinery used in separating smoke from the melting furnaces and from which metallics will be extracted.

The Turo Metal Corporation was recently incorporated in Chicago. The company will manufacture and sell copper, brass and other metals. Signers of the articles of incorporation are **Jerome Morris, Maurice A. Werker** and **Henrietta Raban.**

The Barnes Metal Products Company recently purchased 97,500 square feet of property improved with a one-story brick building, containing 50,000 square feet of floor space. The company paid $200,000 for the property.

The B. Press Company has been incorporated in Chicago with a capital of $7,000 for the purpose of manufacturing and dealing in sheet metal and sheet metal products. Signers of the articles are **Libbie and Bernard Press, Wolf Teital** and **Alexander Press.**

A building, the second and third floors of which are occupied by the **Industrial Sheet Metal Company,** Chicago, was damaged by fire recently. The blaze started in the rear of the first floor and the loss was set at about $5,000. —A. P. N.

Wisconsin Notes

MAY 1, 1929.

J. F. Hahn has been named vice-president and treasurer of the **National Enameling and Stamping Company,** Milwaukee, in charge of finance. **Thomas W. Gulley** has been named a vice-president in charge of sales. Mr. Gulley started with the company at the Baltimore branch and was then transferred to Milwaukee as general sales manager.

The Howard Brass and Copper Company has been capitalized in Milwaukee to deal in metals, metal products, etc. Signers of the articles of incorporation are **J. Howard, A. B. Howard** and **A. L. Howard.**

A five-story addition, 150 by 200 feet, will be erected by the **Manitowoc Plating Works,** Manitowoc, a concern recently bought and now operated by the **Aluminum Goods Manufacturing Company.** With this addition the Aluminum Goods Company's building program for the year will amount to $1,000,000, as a seven-story unit which will be used principally for warehouse purposes is under construction adjacent to the main plant. The five-story building will be for manufacturing and plating. —A. P. N.

Other Countries

Birmingham, England

APRIL 22, 1929.

Local industry continues to improve and, with the exception of a few days' holiday at Easter, fair activity has been maintained. The market in base metals has proved somewhat sensational during the past month, and, while prices gradually rose in copper, the peak was apparently reached when the price touched £97 12s 6d a ton. The quotation still shows an advance as compared with the lowest of the year, touched in January, and also as compared with the lowest level of last year. Many trades in the Birmingham district are large consumers of copper and brass and prices in such lines as tubes have been steadily rising during the past few months. One of the latest advances declared as the result of the rise in base metals was that in hearth furniture.

Jewelers and silversmiths are preparing for the holiday resort season and prominent firms manufacturing electroplated goods are busy. Overseas trade in electroplate and silver is especially good with Canada, the United States, Norway and Sweden. It is stated that the bulk of the trade is in expensive goods and makers find a ready market for new designs and ideas, customers being prepared to buy anything useful while avoiding articles of a flimsy and cheap character. During the next three months buyers will be coming to England from Africa, Australia and South America, and Birmingham makers expect to secure a good share of the business to be placed.

Aluminum hollowware manufacturers meet with a good deal of competition from abroad, but prices are cut severely amongst home firms. Orders from English towns are none too plentiful especially in those areas where trade depression is most marked. A certain number of orders were taken at the Industries Fair but the results of this Show are always difficult to estimate.

The **88th birthday of the Birmingham electroplate trade** fell at the end of March. This business chiefly became famous through the efforts of **G. R. Elkington** and **Henry Elkington,** who patented a process in which was incorporated the application of cyanides of gold and silver in electroplating, founded on the researches of **John Wright,** a Birmingham surgeon. In order to get over the difficulty of raising capital to turn the invention to practical account, Josiah Mason came into the business which was carried on for 24 years under the style of **Elkington and Mason.** Mason provided the capital which started this now famous industry on a sound basis.

The annual dinner of W. Canning and Company, Ltd., the well-known Birmingham electroplating supply firm, was held on March 26. **T. R. Canning** recalled that the first composition the Company made was for use in a bedstead factory. Today, he said, Cannings were making ten tons where in those days they made a pound. The speaker emphasized the need for careful workmanship which, he said, was a factor of vital importance to overseas buyers of their products.

Researches on the subject of improving the soundness of brass castings have recently been carried out by the **British Non-Ferrous Metals Research Association,** who have discovered that an alloy consisting of 76 per cent copper, 22 per cent zinc and 2 per cent aluminum is remarkably resistant to corrosion. Further investigations took place with a view to applying the discoveries to the manufacture of condenser tubes and it was found necessary that the tube castings should be produced by the Durville process, a French process for rotary pouring which is peculiarly adapted for casting brasses containing aluminum. **Charles Clifford and Sons** of Faxeley Street, Birmingham, are now making condenser tubes of this alloy under the brand name of "Al-durbra." As against ordinary 70:30 brass tubes it is claimed that these show far greater resistance to corrosion and erosion, and the firm has issued a booklet dealing with these tubes containing particulars of a number of tests. J. A. H.

Business Items—Verified

The Allen Cone Company and **E. S. Tompkins** have removed their offices to 30 Church Street, New York City, as of May 1, 1929, it is announced.

New England Brass Company, Taunton, Mass., has expanded its office facilities and erected an additional garage in order to care for increased business.

Garland Manufacturing Company announces the removal of its offices to 3003 Grant Building, Pittsburgh, Pa. The company manufactures galvanized conduits, etc.

H. M. Johnquest, general analytical chemist and consultant in electroplating, factory problems, etc., has removed to larger quarters at 480 Watertown Avenue, Waterbury, Conn.

Trico Fuse Manufacturing Company, Milwaukee, Wis., have removed their New York division sales office to 41 Park Row, New York City, in order to provide space for accommodation of increased business.

Precision Grinding Wheel Company, 8300 Torresdale Avenue, Philadelphia, Pa., has awarded a contract for construction of a two-story addition, 97 by 141 feet in area, which will cost about $75,000 with equipment.

Art Metal Construction Company, Jamestown, N. Y., has leased four floors in building 17, terminal warehouse group, 27th Street and 11th Avenue, New York City, to be used as its metropolitan branch and distributing plant.

Algonac Brass Foundry, Algonac, Mich., operating a brass, bronze and aluminum foundry, grinding and polishing departments and soldering room, has changed its name to **Algonac Foundry Company. W. E. Warner** is president.

Bohn Aluminum and Brass Corporation, Detroit, Mich., will centralize its aluminum extrusion operations in a new addition now under construction which will contain 50,000 sq. ft. of floor space and cost about $250,000 with equipment.

Aluminum Smelting and Refining Company, Cleveland, Ohio, which was recently organized, has established a plant at 1265 East 55th Street, Cleveland. Officers of the company are **J. J. Ripner,** president, and **L. J. Kane,** secretary-treasurer.

Pressed Metals of America, Inc., Port Huron, Mich., has asked bids on revised plans for a two-story plant addition, which is part of a $100,000 expansion program. The building now under consideration will cost about $40,000 with equipment.

Patton-MacGuyer Company, Baker Street, Providence, R. I., brass goods manufacturers operating tool room, cutting-up shop, stamping, tinning and other departments, has awarded construction contracts for a one-story, 80 by 160 ft., factory.

Crown Brass Manufacturing Company, East 16th Street, Los Angeles, Calif., has consolidated with the **Los Angeles Brass Foundry** and discontinued the use of the latter name. The Los Angeles firm was acquired last August. The company operates a non-ferrous foundry and casting shop.

Merit Company, 2125 Rice Street, Chicago, Ill., makers of metal caskets for burial, plan construction of a three-story factory, 115 by 315 feet, at Agusta Street and Cicero Avenue, Chicago, at an estimated cost of $350,000. The company operates casting, soldering, plating, polishing and lacquering departments.

E. Ingraham Company, Bristol, Conn., clock and clock movement manufacturers, will erect a one-story addition 50 by 80 feet, to the five-story building now being built. The extension will be used mainly as a lacquer shop. The company has stamping, plating, polishing, lacquering and japanning departments.

Acme Aluminum Foundry Company, 814 West 75th Street, Chicago, Ill., plans construction of a two-story and basement addition, 50 by 125 feet, to cost about $45,000 with equipment. This company has increased its capital from $15,000 to $100,000. It operates an aluminum foundry, tool room, casting shop, soldering and grinding rooms.

Victor Metal Products Corporation, Diamond Street, Brooklyn, N. Y., states that reports to the effect that it is contemplating the erection of a two-story plant addition to cost about $30,000 with equipment are somewhat premature, the matter not having been decided upon as yet. The company manufactures collapsible tubes of tin, lead, aluminum and other metals.

Allied Die-Casting Corporation, Long Island City, N. Y., will occupy a new plant now under construction at 43rd Avenue and 38th Street. The plant will be a four-story concrete building and the company plans to make it a model die-casting establishment, embodying the most modern features available. It will be laid out solely for die-casting operations. It will cost approximately $400,000.

Price Brothers, Inc., and the **Atlas Bronze Manufacturing Company,** manufacturers of tablets, signs, cast bronze specialties and other allied products, will remove to larger quarters at Maplewood and Schubert Avenues, Chicago, Ill., shortly, having outgrown their old plant at Orleans Street. The companies' general offices and sales rooms will remain at 333 North Michigan Avenue.

Leeds and Northrup Company, Philadelphia, Pa., manufacturers of automatic control and recording instruments and other devices, have purchased 190,000 square feet of property adjoining their plants. The purchase includes about 85,000 square feet of new floor space in a modern one-story building on the new property which is stated to be ideally adapted to Leeds and Northrup's manufacturing processes.

Advance Wheel Manufacturing Company, Inc., manufacturers of polishing wheels for all industries, has appointed **Mr. Scheffer** as its Michigan representative, with headquarters at 115 Mayfield Avenue, N. E., Grand Rapids, Mich. Mr. Scheffer, who is well versed in the uses of polishing wheels on metals, was appointed in order to provide complete service to the company's increasing number of customers in Michigan, according to **James J. Manderscheid,** president.

H. Kramer and Company, Chicago, Ill., have acquired property adjoining their present general offices and plant and after remodeling and redecorating, will move their headquarters on about May 10th, to Loomis and 21st Streets. The company is converting present warehouse into an addition to the foundry, in which are being erected two additional furnaces with capacities of fifty tons each. Many devices for labor saving, plant safety and accuracy in smelting are being installed.

The Viking Pump Company, Cedar Falls, Iowa, has acquired the **Falls Foundry Company** and the **Banner Brass Foundry Company,** both of Cedar Falls. According to officials of the Viking company, a minority share of the firm's stock has been disposed of to a group of bankers and the stock is to be listed on the Chicago exchange. The Viking company operates brass, bronze and aluminum foundries, brass machine shops and a tool room. It manufactures rotary pumps and allied products, maintaining a branch at Walkerville, Ontario.

Meneely Bell Company, Troy, N. Y., will cast a chime of bronze bells that has been given to the New York Avenue Presbyterian Church, Washington, D. C., by **Mary Lincoln Isham,** granddaughter of Abraham Lincoln, in memory of her ancestor. It is interesting to note that **Clinton Hanks Meneely,** head of the bell foundry mentioned, is also related to Abraham Lincoln through the line of Lincoln's mother, who belonged to the Hanks family of New England, which has been in the bell foundry business since the early days in America.

The Atlantic Zinc Works, 210 Van Brunt Street, Brooklyn, N. Y., was visited by a large number of employes and executives of photo-engraving establishments in the New York district, who were invited to look over the plant of the Atlantic company on Saturday, April 27. The visitors were brought to the plant in buses, were served with a luncheon and were then given a demonstration of the manufacture of "Zomo" zinc, a product of the Atlantic company which is used extensively for printing plates. After this the party was taken to the plant of the **National Steel and Copper Company,** 216 Taaffe Place, Brooklyn, where the finishing of zinc and copper plates was demonstrated and explained.

The Brown Instrument Company, Philadelphia, Pa., will expand its plant by the immediate construction of a new two-story and basement building on the site of one of its present one-story buildings which is to be demolished. The company will at the same time construct a new two-story central wing. Reinforced concrete construction will be used and the buildings will cost about $200,000. The new wings

will add about 50 per cent more floor space to the plant, providing larger receiving, shipping and material handling areas, and also increased manufacturing and research room. This is the fourth expansion of the Brown plant in eight years. Less than a year ago the company completed a two-story addition.

Precision Machine and Foundry, Ltd., Calgary, Alberta, Canada, has started construction of the foundations for a new non-ferrous foundry. The company has ordered a new furnace of 1,000 pounds capacity for iron casting work and other new equipment will probably be purchased as the plant nears completion. The company states it has been doing a considerable amount of automobile and tractor work but expects to branch out into larger general engineering business upon completion of the plant. The company casts brass, bronze, aluminum and iron. A machine shop is operated. It is the company's intention, according to **Charles K. Vernon,** manager, to open branches in several of the larger cities of Canada.

Review of the Wrought Metal Business

By J. J. WHITEHEAD
President, Whitehead Metal Products Company of New York, Inc.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

MAY, 1, 1929.

After several weeks of uncertainty due to the wide fluctuations in the price of ingot copper, the market for fabricated brass and copper materials is returning to something near a normal condition. The trade is consuming metal in the same large volume as that which has prevailed for several months, but most of the buying has been done against contracts placed at lower price levels. There is a keen appreciation of the fact that the consumers were in some measure responsible for bidding the price of copper up to the extremely high point, and with the recent 25% drop in price, fresh in mind, it is hardly likely that another buying movement will develop a stampede similar to the last. It is generally felt that a reasonable price maintained at a fairly steady level will help to keep the business active and continue the widespread use of Brass and Copper, whereas such fire works as have lately been exhibited have a very bad effect on the entire industry.

Some new business is being offered at current prices in the belief that the market will probably not be any lower for some time, and the hope is that this level may be maintained.

Demand for nickel and nickel alloys still continues heavy, with the result that deliveries are extremely difficult to get. The requirements for shot nickel are greatly in excess of the productive capacity, and although the refining units are being expanded constantly and production is being increased, orders are being received in such large volume that all new output is absorbed as fast as available.

Another impressive and important fact is that all records for monthly bookings of Monel metal orders were broken in April. Much of this prosperity is due, of course, to the healthy condition of the industries to which Monel metal and nickel are generally applied, but the demand for new applications also plays an extremely important part. The national advertising on Monel metal and brass and copper for use in the home is developing widespread interest, and a considerable volume of business over the entire country.

Metal Market Review

By R. J. HOUSTON,
D. Houston and Company, Metal Brokers, New York

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Copper

MAY 1, 1929.

A variety of forces played a decisive part in bringing about an exceedingly sharp reaction in the market for copper lately. Stringent money rates, a violet slump in stock exchange prices and heavy liquidation of securities, plus a bold bear raid on copper in London all combined to create severe depression in the entire situation. Local and foreign prices suffered the sharpest break in many years. The New York level dropped from 24 to 18 cents in the short space of eight days. Weakness was specially pronounced at the London center.

The whole market was consequently depressed and confused for a considerable time. This strange reversal of sentiment and action created surprise and bewilderment in every quarter of the trade, and the immediate effect was to make consumers conspicuously conservative in their attitude to the market. Then again, custom smelters were taking in material for which it was necessary to find an outlet. Leading producers were sold ahead and out of the market. Meanwhile, confidence was shaken and the withdrawal of buyers for a time made sales difficult. Finally custom smelters and consumers found a common meeting ground, and on the basis of 18 cents, delivered to Connecticut Valley points, a good tonnage was disposed of. The export price has also been reduced to 18.30 cents c. i. f. European ports. Custom smelter offerings have been well absorbed for the time being. Under present conditions consumers are able to cover requirements at substantial concessions from recent top prices, and the trade generally now await the action of the large producers when they return to the market as sellers.

Consuming demand and manufacturing undertakings have run ahead of the industry's capacity to supply the refined metal. The fundamental situation in copper is therefore peculiarly strong. Statistics for March show that a greater tonnage of the metal was shipped to domestic manufacturers than in any other single month in the history of the industry. Available supplies in primary hands are down to less than a fortnight's requirements. A huge world consumption is in progress, with indications of new construction developments which should broaden the volume of demand still more. Consumption of copper is moving with swift pace and demand is not going to stop growing.

Zinc

There was considerable irregularity in prices of slab zinc recently, and the market eased off again by easy stages from the firmer tone of a month ago. New demand was quiet, but producers were well booked up with orders against former contracts. Shipments into consumption were consequently maintained in good volume, but a lull in market activity caused a decline in near-by metal to 6.50c to 6.55c East St. Louis and 6.85c to 6.90c at New York. These quotations compare with 6.80c East St. Louis basis and 7.15c New York at beginning of April. Production capacity appears to be in oversupply for consumptive ability. The remedy is obviously that of curtailment until a balanced situation is achieved. World zinc production in March amounted to 137,874 tons, against 121,996 tons in February and 131,169 tons in January. United States production in March was 55,471 tons, being the largest domestic output in a year. Shipments in March, however, were 58,129 tons, the heaviest in over a year.

Tin

Trading in tin was fairly active in April, but heavy liquidation both for New York and London account exerted a depressing influence on prices. During the first three weeks of the past month the market for prompt Straits tin declined from 48¾c to 44¼c, a drop of 4½ cents per pound. The decline brought the price down to the lowest since 1924 when the market touched a low of 40 cents a pound. There was some recovery in price later in the month, but the exhibition of strength was not specially impressive. Consumption of tin in this country is on a large scale but production and world supplies are also large. Total visible

of tin on April 1, 1929, was 26,632 tons compared with 15,586 tons on April 1, 1928. Recent production was on the increase, but in spite of this, price movements in tin are acutely susceptible to speculative action and control. There was a further decline to 43⅝c for Straits tin.

Aluminum

Aluminum consumption continues at a high level and the volume of output is readily absorbed at an unusually heavy rate. Demand has broadened lately and the outlook is considerad favorable for the coming months. Production by the leading interest showed an increase of 28 per cent in 1928, but requirements were greater than ever before. Foreign concerns have also made plant extensions. Competition abroad, however, has been keen, but the growing demand from the automobile industry and from other sources is providing a free outlet for production. Domestic prices are maintained at previous quotations for all grades of new metal. There has been little or no variation in market values of virgin aluminum during the past year and a quarter.

Antimony

There was little doing in antimony for a considerable period in April and at times prices were more or less nominal. A fairly steady tone prevailed even in the face of dull demand. More active trading developed in the first half of the month when the market struck the level of 9⅜c for spot and nearby positions. A substantial tonnage was sold at that price duty paid. Chinese shipments for future delivery were also offered at 7⅜c c. i. f. New York, being the equivalent of 9⅜c duty paid, and a slight shading of this figure was reported as accepted for future delivery. Stocks of antimony in bonded warehouses on March 1 were reported at 2,610,645 pounds, showing an increase of 192,544 pounds during the month. The spot market for Chinese regulus quotes 9½c duty paid, with indications that 9⅜c would find sellers.

Lead

The lead market receded from its previous firm position, and during the first half of April there were four successive reductions in prices. The downward movement showed an aggregate decline of ¾c a pound, namely from 7¾c to 7c at New York. The St. Louis basis is quoted at 6.80c to 6.85c, with a moderate demand for nearby delivery. There appears to be indications of stability at the present level and consumers are showing more interest as this impression makes for confidence in the situation. Consumption is on a brisk scale. Automobile makers and the public utility group of consumers are exceedingly busy. These outlets for production continue to absorb heavy shipments. New demands seem assured, and the second quarter of the year is expected to show good consumer buying.

Quicksilver

There has been comparatively little activity reported in this market recently. The tone was easy at $123 per flash, but the larger buyers were inclined to wait for more attractive prices.

Platinum

No new features come to light regarding this article, and prices have held steady at $66.50 per ounce for refined platinum.

Silver

Further declines were recorded in silver lately, with the bullion price down to 55⅛c per ounce. This is the lowest level in over a year and a half. China bought and sold to a moderate extent, but India was not active enough to change the dull tendency. United States output of silver in March amounted to 4,820,000 fine ounces against 4,776,000 ounces in February. The monthly average in 1928 was 4,679,000 ounces, according to the American Bureau of Metal Statistics. Silver stocks in Shanghai on April 19 totaled 172,500,000 taels. The figures for the previous week were 169,400,000 taels.

Old Metals

The sudden and abrupt fall in prices of electrolytic copper caused a sharp downward trend for copper and brass scrap material. All grades of the latter were conspicuously weak owing to the unsettled conditions and heavy offerings by holders. Sales were difficult to make on the basis of quotations for new copper. The break in secondary material was fully as great as the deep cut in price of electrolytic. Offerings of brass grades were in large volume and showed anxiety to liquidate. Price movements at end of month began to show a steadier tone, but these were much below the position a few weeks ago. Lead was also lower, and a general uncertainty prevailed throughout the trade. At month end dealers buying prices were quoted at 15¼c to 15½c for selected crucible copper, 13¾c to 14c for heavy copper and wire, 11¾c to 12c for light copper, 7¾c to 8c for heavy brass, 7c to 7⅛c for light brass, 5¼c to 5½c for heavy lead, and 17¼c to 18c for aluminum clippings.

Daily Metal Prices for the Month of April, 1929

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	4	5	8	9	10	11	12	15	16
Copper c/lb. Duty Free												
Lake (Delivered)	24.125	24.125	24.125	23.50	23.50	23.00	19.75	19.50	19.50	19.25	19.25	18.25
Electrolytic (f. a. s. N. Y.)	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	19.75	19.125	19.125	18.00
Casting (f. o. b. N. Y.)	23.50	23.50	23.75	23.00	23.00	22.00	19.00	18.875	18.875	18.625	18.375	17.625
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	6.80	6.80	6.80	6.80	6.80	6.80	6.65	6.65	6.65	6.70	6.70	6.70
Brass Special	6.90	6.90	6.90	6.90	6.90	6.90	6.85	6.85	6.85	6.85	6.85	6.85
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	48.75	48.60	48.50	48.15	48.00	47.50	46.70	46.50	46.75	45.75	45.20	45.625
Pig 99%	47.75	47.625	47.625	47.25	47.00	46.625	45.75	45.625	45.875	44.875	44.25	44.75
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	7.75	7.75	7.75	7.40	7.40	7.10	7.10	7.00	7.00	7.00	6.85	6.85
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	9.75	9.75	9.625	9.625	9.625	9.625	9.625	9.50	9.375	9.625	9.625	9.50
Silver c/oz. Troy Duty Free	56.25	56.125	56.00	56	55.50	55.875	56	56	56.125	56	55.625	55.875
Platinum $/oz. Troy Duty Free	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50

	17	18	19	22	23	24	25	26	29	30	High	Low	Aver.
Copper c/lb. Duty Free													
Lake (Delivered)	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.125	18.125	24.125	18.125	20.006
Electrolytic (f. a. s. N. Y.)	18.00	18.00	18.00	18.	18.00	18.00	18.00	18.00	18.	18.	24.00	18.00	20.264
Casting (f. o. b. N. Y.)	17.625	17.625	17.625	17.625	17.625	17.625	17.625	17.625	17.625	17.625	23.75	17.625	19.381
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb													
Prime Western	6.60	6.55	6.55	6.55	6.55	6.55	6.60	6.60	6.60	6.60	6.80	6.55	6.664
Brass Special	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.90	6.80	6.841
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	45.375	45.25	44.25	44.50	44.875	45.	44.125	43.75	44.00	44.20	48.75	43.75	45.370
Pig 99%	44.50	44.375	43.375	43.625	44.00	44.25	43.375	43.00	43.125	43.375	47.75	43.00	45.041
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	6.85	6.85	6.95	6.85	6.85	6.85	6.85	6.85	6.85	6.80	7.75	6.80	7.084
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.375	9.375	9.125	9.75	9.125	9.538
Silver c/oz. Troy Duty Free	55.875	55.75	55.625	55.50	55.75	55.625	55.25	55.125	54.625	54.75	56.25	54.625	55.903
Platinum $/oz. Troy Duty Free	66.50	66.50	66.50	66.50	66.50	66.50	66.50	65	65	65	66.50	65	66.195

Metal Prices, May 6, 1929

NEW METALS

Copper: Lake, 18.125. Electrolytic, 18.00. Casting, 17.50.
Zinc: Prime Western, 6.55. Brass Special, 6.75.
Tin: Straits, 44.00. Pig, 99%, 43.15.
Lead: 6.80. **Aluminum,** 24.30. **Antimony,** 9.00.

Nickel: Ingot, 35. Shot, 36. Elec., 35. Pellets, 40.
Quicksilver: flask, 75 lbs., $123. **Bismuth,** $1.70.
Cadmium, 95. **Cobalt,** 97%, $2.60. **Silver,** oz., Troy, 54.875.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $65.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	13½
Brass Ingots, Red	16¼to18
Bronze Ingots	17¼to19
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	28 to40
Manganese Bronze Ingots	16 to21
Manganese Bronze Forging	36 to44
Manganese Copper, 30%	30 to40
Monel Metal Shot	28
Monel Metal Blocks	28
Parsons Manganese Bronze Ingots	16½to19¾
Phosphor Bronze	19 to22
Phosphor Copper, guaranteed 15%	24½to26
Phosphor Copper, guaranteed 10%	23½to25
Phosphor Tin, no guarantee	55 to70
Silicon Copper, 10%, according to quantity	30 to35

OLD METALS

Buying Prices		Selling Prices
18½to19	Heavy Cut Copper	19½to20
17½to18	Copper Wire, mixed	18½to19
15 to15¾	Light Copper	16 to16¾
15 to15¾	Heavy Machine Composition	16 to16¾
11 to11¾	Heavy Brass	12 to12¾
9¼to 9½	Light Brass	10¼to10½
11¾to12	No. 1 Yellow Brass Turnings	12¾to13
14 to14½	No. 1 Composition Turnings	15 to15½
5¾to 6	Heavy Lead	6½to 6¾
3½to 3¾	Zinc Scrap	4¼to 5¼
8 to10	Scrap Aluminum Turnings	12½to14¼
13 to13½	Scrap Aluminum, cast alloyed	17½to18½
19 to20	Scrap Aluminum sheet (new)	22 to22½
30½to32	No. 1 Pewter	35 to38
20 to21	Old Nickel Anodes	22 to23
20 to23	Old Nickel	22 to25

Wrought Metals and Alloys

COPPER SHEET

Mill shipment (hot rolled) .....27¾c. to 28¾c. net base
From Stock .....28¾c. to 29¾c. net base

BARE COPPER WIRE

19¾c. to 19⅞c. net base, in carload lots.

COPPER SEAMLESS TUBING

29¼c. to 30¼c., net base.

SOLDERING COPPERS

300 lbs. and over in one order .....26¼c. net base
100 lbs. to 200 lbs. in one order .....26¾c. net base

ZINC SHEET

Duty sheet, 2c., per pound — Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 8 per cent discount .....10.28 net base
Casks, jobbers' price .....10.50 net base
Open casks, jobbers' price .....11to11.50 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price, ton lots.....33.30c.
Aluminum coils, 24 ga., base price, ton lots.....31.00c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods.....	53c.	Cold Rolled Sheet.....	60c.
Hot Rolled Rods.....	45c.	Full Finshed Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 56½c. to 58½c. per ounce, Troy.

BRASS MATERIAL—MILL SHIPMENTS

In effect April 16, 1929
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.23¼	$0.25	$0.26¼
Wire	.23¾	.25½	.26¾
Rod	.21¼	.25¾	.27
Brazed tubing	.30⅞	....	.35⅞
Open seam tubing	.31¼	....	.34¼
Angles and channels	.31¼	....	.34¼

BRASS SEAMLESS TUBING

28¼c. to 29¼c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	25¾c. net base
Muntz or Yellow Metal Sheathing (14"x48")	24c. net base
Muntz or Yellow Rectangular sheet other Sheathing	25c. net base
Muntz or Yellow Metal Rod	22¼c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality.....	31⅜c.	10% Quality.....	34⅛c.
15% Quality.....	33c.	15% Quality.....	37¾c.
18% Quality.....	34¼c.	18% Quality.....	41c.

MONEL METAL, SHEET AND ROD

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs. 25c. over. Prices f. o. b. mill.

Supply Prices, May 6, 1929

ANODES

Copper: Cast, Rolled, oval, Rolled, sheets, trimmed; Brass: Cast — Quotations uncertain, due to rapid fluctuation of copper prices.

Zinc: Cast ..... 12½c. per lb.

Nickel: 90-92% ..... 45c. per lb.
95-97% ..... 47c. per lb.
99% ..... 49c. per lb.

Silver: Rolled silver anodes .999 fine are quoted from .58¼c. to .60¼c., Troy ounce, depending upon quantity.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & Over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 64/68 Unbleached	$28.10 to $29.00
14" 20 ply 64/68 Unbleached	37.15 to 37.30
12" 20 ply 80/92 Unbleached	31.50 to 31.85
14" 20 ply 80/92 Unbleached	42.85 to 43.20
12" 20 ply 84/92 Unbleached	40.80 to 42.50
14" 20 ply 84/92 Unbleached	54.60 to 57.00
12" 20 ply 80/84 Unbleached	37.40 to 38.35
14" 20 ply 80/84 Unbleached	50.45 to 52.00
Sewed Pieced Buffs, per lb., bleached	40c. to 73c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.14-.19
Acid—Boric (Boracic) Crystals	lb.	.08½
Chromic, 75 and 125 lb. drums	lb.	.20½-.21
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.17¼-21¾
Denatured, drums	gal.	.48-.57
Alum—Lump, Barrels	lb.	.03¼
Powdered, Barrels	lb.	.039
Aluminum sulphate, commercial tech.	lb.	.02⅜
Aluminum chloride, solution in carboys	lb.	.06½
Ammonium—Sulphate, tech., bbls.	lb.	3.3
Sulhpocyanide	lb.	.65
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls.	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.25
Chromic Sulphate	lb.	.37
Copper—Acetate (Verdigris)	lb.	.23
Carbonate, bbls.	lb.	.21½
Cyanide (100 lb. kegs)	lb.	.55
Sulphate, bbls.	lb.	6.7
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$70.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron Sulphate (Copperas), bbl.	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13¼
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate, dry bbls.	lb.	.35
Chloride, bbls.	lb.	.20
Salts, single, 300 lb. bbls.	lb.	.13
Salts, double, 425 lb. bbls.	lb.	.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.09
Potassium Bichromate, casks (crystals)	lb.	.09¼
Carbonate, 96-98%	lb.	.06¾-.07
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.05½
Silver Chloride, dry, 100 oz. lots	oz.	.45
Cyanide (fluctuating)	oz.	.54
Nitrate, 100 ounce lots	oz.	.39
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.18
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls.	lb.	.04¾
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.02
Sulpho Cyanide	lb.	.32½
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.36
Tripoli, Powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11
Chloride, casks	lb.	.06¾
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03¾

Crucibles
Flexibility

Crucibilities

Well fitting lifting tongs will pay dividends in increased crucible service. See that your tongs conform to the size and shape of the crucible number you are using. This is best accomplished by making a metal casting using the crucible itself as the pattern. The tongs can then be accurately and quickly "shaped" at regular intervals.

Chicago Crucible Company, Chicago, Ill.

Joseph Dixon Crucible Co, Jersey City, N. J.

Lava Crucible Co. of Pittsburgh, Pittsburgh, Pa.

Naugatuck Valley Crucible Co. Shelton, Conn.

Ross-Tacony Crucible Co. Tacony, Philadelphia, Pa.

Vesuvius Crucible Company. Swissvale, Pa.

Jonathan Bartley Crucible Co., Trenton, N. J.

Product flexibility:

To meet the varying metal schedules demanded by many different types of products, plumbago (graphite) crucible melting is the only known process by which it is possible to combine real *flexibility* with true economy.

Quality flexibility:

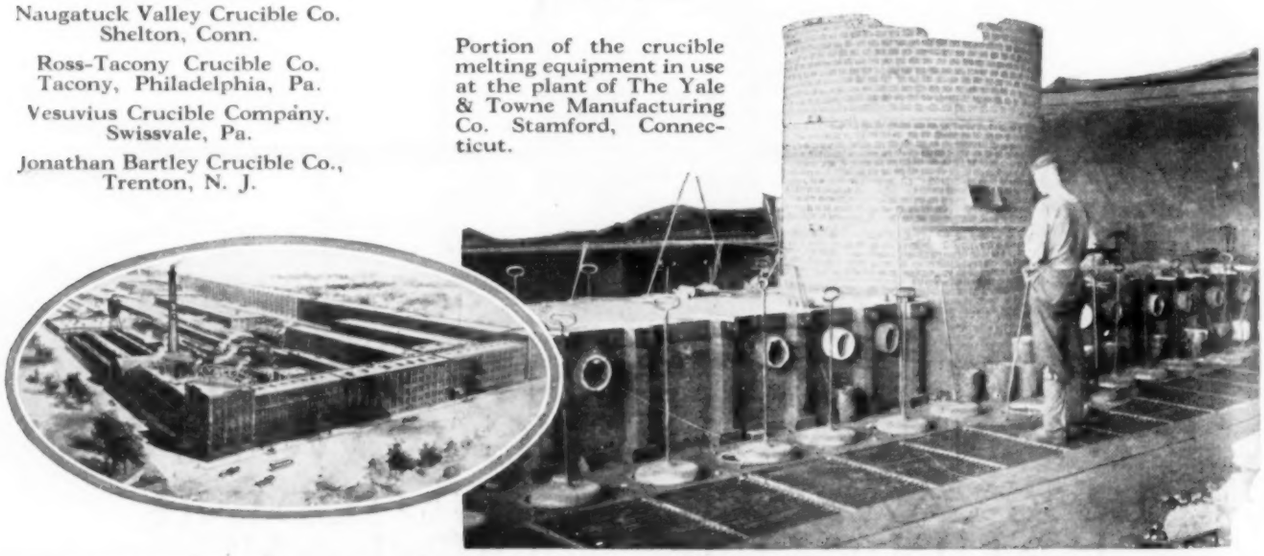
In a melting schedule where uniform quality must be absolutely pre-determined, the possibility of the segregation of certain sizes of crucibles to be used only for certain metals or alloys, is an outstanding example of the *flexibility* of plumbago crucible melting.

Operating flexibility:

Permitting independent operation with no cost when idle, the use of crucible furnaces makes possible the utmost *flexibility* of operation and at the same time your cost line assumes the properties of a rubber band so closely does it follow actual profitable production.

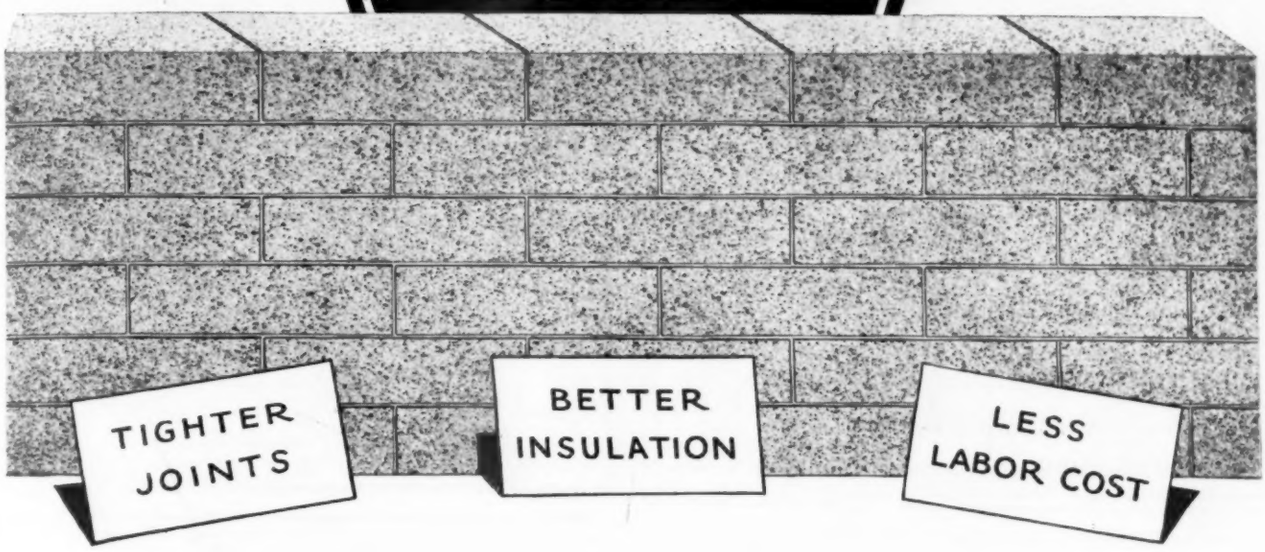
Ask our representatives about other outstanding features of graphite crucible melting equipment.

Portion of the crucible melting equipment in use at the plant of The Yale & Towne Manufacturing Co. Stamford, Connecticut.



FLEXIBILITY–ADAPTABILITY–RELIABILITY–ECONOMY

What "Sizing" Means



THE machine sizing of Armstrong's and Nonpareil Insulating Brick means that all brick of the same type are uniform, with smooth clean surfaces, edges, and corners. It means that they are all exactly the same size. With machine-sized brick you have no sorting or trimming to do—no off sizes or culls to throw away.

Armstrong's and Nonpareil Brick, *machine sized*, lay up faster and better. They make thinner joints and fewer heat leaks.

Machine sizing is now standard for all Armstrong's and Nonpareil Brick, not only straight brick, but shapes as well (except the curved surfaces of circle brick). Sizing is a refinement that increases the efficiency of the insulation, reduces waste of material and time, and lessens the cost of laying.

A full-size brick, straight or shape, Armstrong's or Nonpareil, will be sent on request for your inspection and testing.

ARMSTRONG CORK & INSULATION COMPANY

918 Concord Street, Lancaster, Pa.

Armstrong's and Nonpareil Insulating Brick

For Furnaces, Boilers, Ovens, etc.

Turner Power Sprue Cutter No. 102

A substantial Tool of the latest type, capacity 1″ brass or its equivalent.

Send for full particulars. Also Catalog M-2 for our Hand and Power Molding Machines, Cock Grinders, Sand Sifters.

TURNER FOUNDRY & MACHINE COMPANY

917-25 W. Schiller St. Philadelphia, Pa.

Our Special Chromium Plating Department

Can take care of finishing your products in this remarkable everlasting color, in any quantity large or small on a Jobbing or Contract basis.

Ten thousand square feet of floor space plus modern equipment guarantees to you large production facilities and prompt deliveries, consistent with reasonable charges.

We also do Electro Plating of any description in the following finishes:

Gold — Silver — Brass — Copper — Nickel—Tin —Zinc—Cadmium on Steel or Iron.

Barrel Plating of the above finishes on stampings and small parts. Automatic Ball Burnishing—Polishing—Acid Dipping. Lacquering and Spraying in all colors.

COHAN-EPNER CO., Inc.

The Prompt Service Electro Platers

122-130 CENTRE ST. NEW YORK CITY

Phone: Worth 2462-2463

The Babcock & Wilcox Co.

85 LIBERTY STREET, NEW YORK

ESTABLISHED 1868

Water Tube Boilers — Steam Superheaters
Economizers — Air Preheaters
Chain Grate Stokers — Oil Burners
Refractories
Seamless Tubes and Seamless Pipe

BRANCH OFFICES

ATLANTA	Candler Building
BOSTON	80 Federal Street
CHICAGO	Marquette Building
CINCINNATI	Traction Building
CLEVELAND	Guardian Building
DALLAS, TEXAS	Magnolia Building
DENVER	444 Seventeenth Street
DETROIT	Ford Building
HOUSTON, TEXAS	Electric Building
LOS ANGELES	Central Building
NEW ORLEANS	344 Camp Street
PHILADELPHIA	Packard Building
PHOENIX, ARIZ.	Heard Building
PITTSBURGH	Koppers Building
PORTLAND, ORE.	Failing Building
SALT LAKE CITY	Kearns Building
SAN FRANCISCO	Sheldon Building
SEATTLE	Smith Tower
HONOLULU T. H.	Castle & Cooke Building
HAVANA, CUBA	Calle de Aguiar 104
SAN JUAN, P. R.	Recinto Sur 51

Cleaning Room Equipment

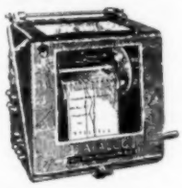
Sandblast Cabinets
Sandblast Barrels
Sandblast Rooms
Dust Arrestors
Exhaust Systems
Tumbling Mills
Grinders

The New Haven Sandblast Company

3558 Erie Bldg. CLEVELAND	378 Waterfront NEW HAVEN	457 Call Bldg. SAN FRANCISCO

DO YOU ANNEAL?

If so use our recording or controlling pyrometers and, to check results, use our Rockwell Hardness Tester.

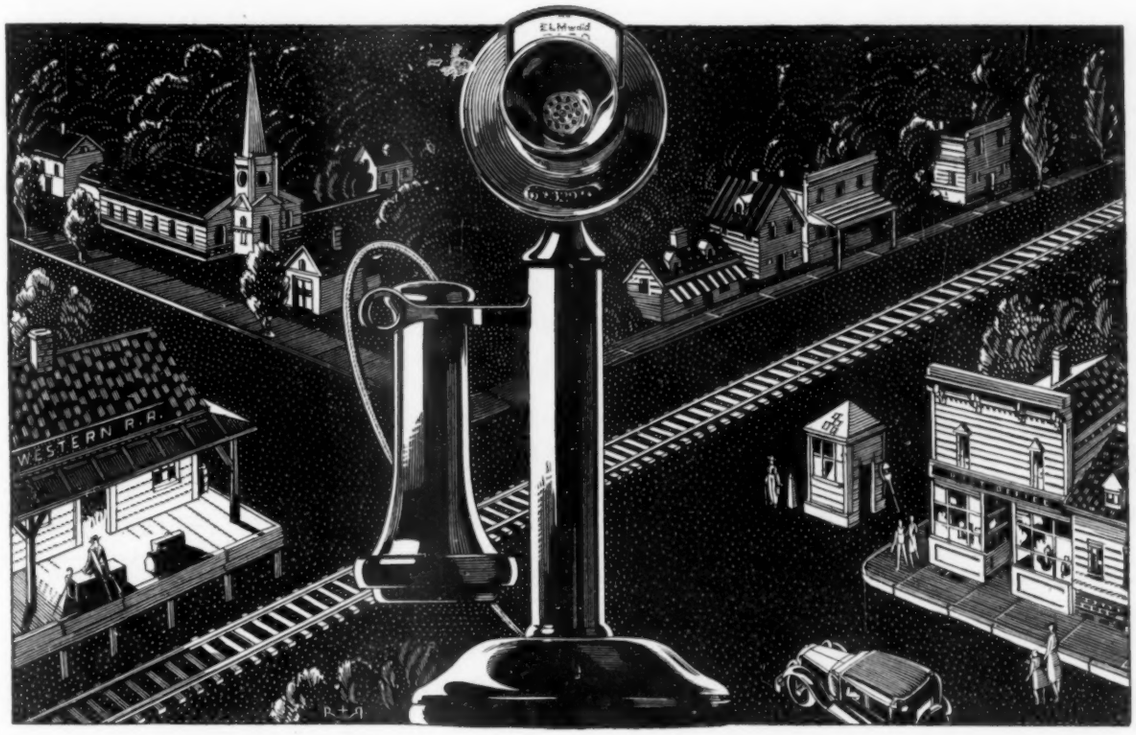


WILSON-MAEULEN CO

INCORPORATED

731 E. 143d St. **NEW YORK**

Stranded in a Small town . . . He kept both Engagements by Telephone



A PLANT superintendent of a large tire company was on a business trip in Canada. He missed his connection and was stranded in a town with one train a day. Two important engagements loomed ahead—one in Toronto, the other in New York. He thought of the telephone. He called the two cities. He completed his business so satisfactorily in both places that neither of the trips was necessary.

The telephone is always ready to put important things through. A man in St. Louis was too busy to go to Memphis and back. He made the round trip by telephone. It resulted in $1400 worth of business.

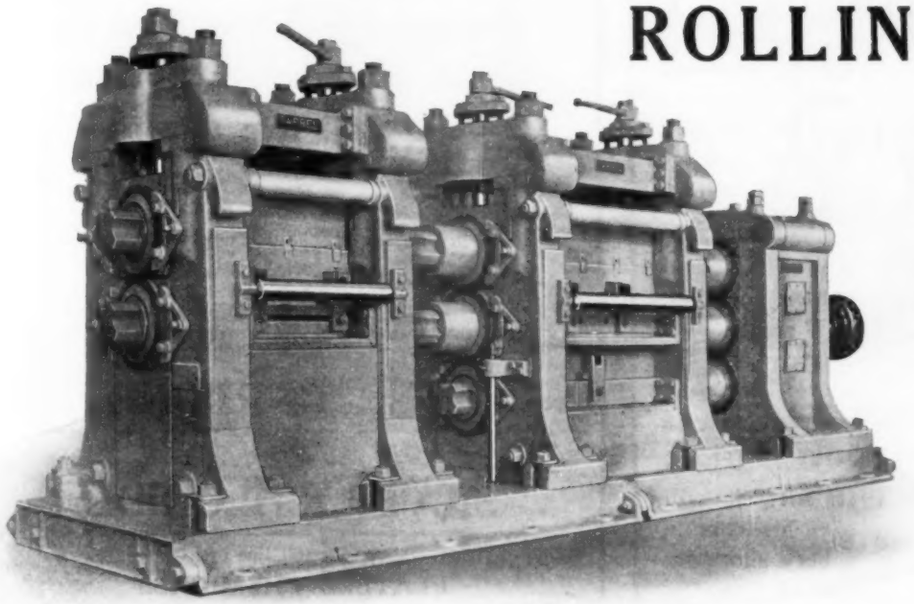
A Seattle lumber company received a carload order on condition that it could be shipped in five days. Special items had to be cut. A telephone call to Portland, costing $1.15, found a mill that could do the work. The car was shipped in time.

A Minnesota commission house invested $43.60 in nine Long Distance calls to five cities and sold 60 carloads—$24,840 worth—of potatoes.

What delay, worry or expense could you save today? Is there a misunderstanding to be adjusted, an important sale or purchase hanging fire? Calls are cheap.

Typical station to station day rates: Chicago to South Bend, 60c. Peoria to St. Louis, 90c. Cleveland to Philadelphia, $1.60. Pittsburgh to St. Louis, $2.35. Boston to Chicago, $3.25.

Out of town calling is quick and calling by number takes even less time. Bell Telephone Service. *Quick. Inexpensive. Universal.*



ROLLING MILLS IN THE MODERN MANNER

FARREL-BIRMINGHAM Rolling Mills are designed by engineers of the modern school, fully conversant with the requirements for rolling non-ferrous metals and constantly on the alert for new and better methods. They have brought about a new standard in Rolling Mill design which brings these machines into the class of precision equipment.

Here are some of the refinements in design which are responsible for higher operating efficiency, increased production and lower rolling costs:

Anti-friction bearings for rolls and mill pinions.

Universal joints connecting rolls and pinions.

Totally enclosed pinion units with Farrel-Sykes, continuous-tooth, heat-treated, alloyed-steel, cut double helical pinions.

Rolls of special alloys, stronger and with harder, more durable and more accurately and finer finished surfaces.

The benefits derived from these and other features of improved design are large savings in power, labor, and maintenance, fewer interruptions to production, and smooth and quiet running far in advance of ordinary practice.

To those who wish to bring their equipment and methods into line with modern practice our engineers can supply detailed data relating to plant layout, operation, etc., which will indicate how these advantages may be obtained.

FARREL-BIRMINGHAM COMPANY
Incorporated
ANSONIA, CONN., U .S. A.
Successor to
Farrel Foundry & Machine Co., Est. 1848
Birmingham Iron Foundry, Est. 1836

"PECK"

Drop Hammers and Automatic Lifters

Uniform products assured by evenly adjusted and unvarying stroke.

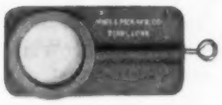
Proper proportion of hammers and anvils eliminates vibration.

Power lifters increase production.

A complete catalog awaits your request.

"M & P"

BLAST GATES



Designed to regulate the flow of air, gas, heat, granular substances, etc.

Made in a variety of types and sizes for different purposes. A complete selection carried in stock for prompt shipment.

MINER & PECK DEPT.
FARREL-BIRMINGHAM COMPANY, INC.
DERBY, CONN.

"Sergeant Burr Nish"

STEEL BURNISHING BALLS

AND

METALLIC BURNISHING MATERIALS

MANUFACTURED BY

THE HARTFORD STEEL BALL COMPANY

609 Franklin Ave., HARTFORD, CONN.

New York Office
3636 Park Ave.
Phone BIN gham 6654

Detroit Office
Byron B. Holt
810 Stephenson Building
Phone Northway 2061

Chicago Office
27 North Jefferson St.
Phone Franklin 4357

ALLIED IPCO

Reduce Your Costs

with

Guaranteed Improved Products

BUFFS
POLISHING WHEELS
PUMICE STONE
ABRASIVES
PLATERS' SUPPLIES
and
A Full Line of Metal Cleaners
Manufacturers

Allied Industrial Products Co.

17 and 19 N. Elizabeth St. CHICAGO

Polishers Attention

You need good Emery.

This is especially true in preparing surfaces for Chromium plating, or any other surface in which it is desired to have no scratches.

Improved Keystone Emery is always good.

Let's get together for better ways of polishing. A competent Research Department is at your immediate command.

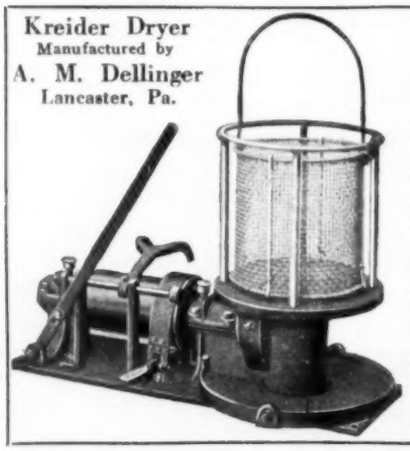
You are invited to submit your problems and share in this free service.

May we serve you?

KEYSTONE EMERY MILLS

4318 Orchard St. Philadelphia, Pa.

Kreider Dryer
Manufactured by
A. M. Dellinger
Lancaster, Pa.



10 ADVANTAGES
OF
KREIDER DRYER

1. Dry s articles evenly, quickly and without stain.
2. Lacquered articles will not stick together. Lacquer will not lump.
3. Articles need not be especially heated to dry.
4. Gives a neater finish to lacquered articles.
5. Practically no waste of liquid.
6. Causes no dirt or disorder.
7. Occupies floor space of only 14 x 33 inches.
8. Uses a very s m a l l amount of power. Speed of 550 R. P. M.
9. May be operated either up the work. by one or two men.
10. Saves labor and spoods

Electroplating Generators
Motor Generators

50 up to 10,000 amperes

Sturdy—Efficient—Dependable

Up-to-date apparatus in every detail; leaders in this line. Write for Bulletin.

Chas. J. Bogue Electric Co.

132-138 King Street, New York

One Portable Filter Machine Takes Care of Entire Plant

Filters Nickel, Chromium, Cadmium, Cyanide, Brass, Copper, Zinc, Silver

This machine will earn $50 to $100 a day on general tank cleaning jobs

Larger Plants Often Save the Cost of Our Machine on One General Tank Cleaning Job

Keep solutions clean and make possible smoother and brighter plating. Also plate faster account of less resistance and better throwing power of clear solutions. Better plating reduces buffing and polishing costs. With our equipment, cost of keeping solutions clean is just about nil.

Note the Low Prices on Complete Portable Machines

MOTOR SIZE	CAP. THRU FILTER NICKEL 10 BE	CAPACITY ON FREE HOSE	COMP. PORT MACHINE FOR NICKEL	COMP. PORT MACHINE CY. OR CAD.	PORTABLE MACH. WITHOUT SWITCH & CORD	MOTOR
2 H.P.	1400 G. hr.	4500 G. hr.	$330.00	$320.00	$60.00	less
1½ H.P.	1000 G. hr.	3500 G. hr.	280.00	270.00	50.00	less
1 H.P.	800 G. hr.	2500 G. hr.	270.00	260.00	50.00	less
¾ H.P.	500 G. hr.	2000 G. hr.	250.00	240.00	40.00	less

Complete extra filters set on cover for 1½, 1 and ¾ H.P. machines, cyanide sol. ..... $40.00 Nickel & Chrome $47.50
Complete extra filters set on cover for 2 H.P. larger machine, cyanide sol. ..... 50.00 Nickel & Chrome 60.00

On machines for nickel and cyanide solutions filter tank is coated with RUBBERLINE COMPOUND, to prevent corrosion. If outfit is also to be used on CHROMIUM or ACID COPPER SOLUTION then tank will need sheet lead lining and prices will be $10.00 higher on ¾, 1, 1½ H.P. sizes and $15.00 on 2 H. P. machine.

REGARDING EXTRAS ON MOTORS

On 1, 1½, 2 H.P., 220 or 440 volt 60 cy. 2 or 3 ph. ..... Prices net.
On ¾ and 1 H.P. single ph. or D.C. current... Prices net.
On 1¼ H.P. single ph. 60 cy. current..... Prices $5.00 higher
On 2 H.P. single ph. 60 cy. current..... Prices 7.50 higher
On ¾ H.P. single ph. 25 or 30 cy. current... Prices 5.00 higher
On 1 H.P. three ph. 25 or 30 cy. current... Prices $10.00 higher
On 2 H.P. three ph. 25 or 30 cy. current... Prices 15.00 higher
On 1½ H.P. D.C. 220 volts current..... Prices 10.00 higher
On 2 H.P. D.C. 220 volts current..... Prices 15.00 higher
On 440 V. & 550 volt or 2 phase, machines cannot be furnished in less than 1 H.P.

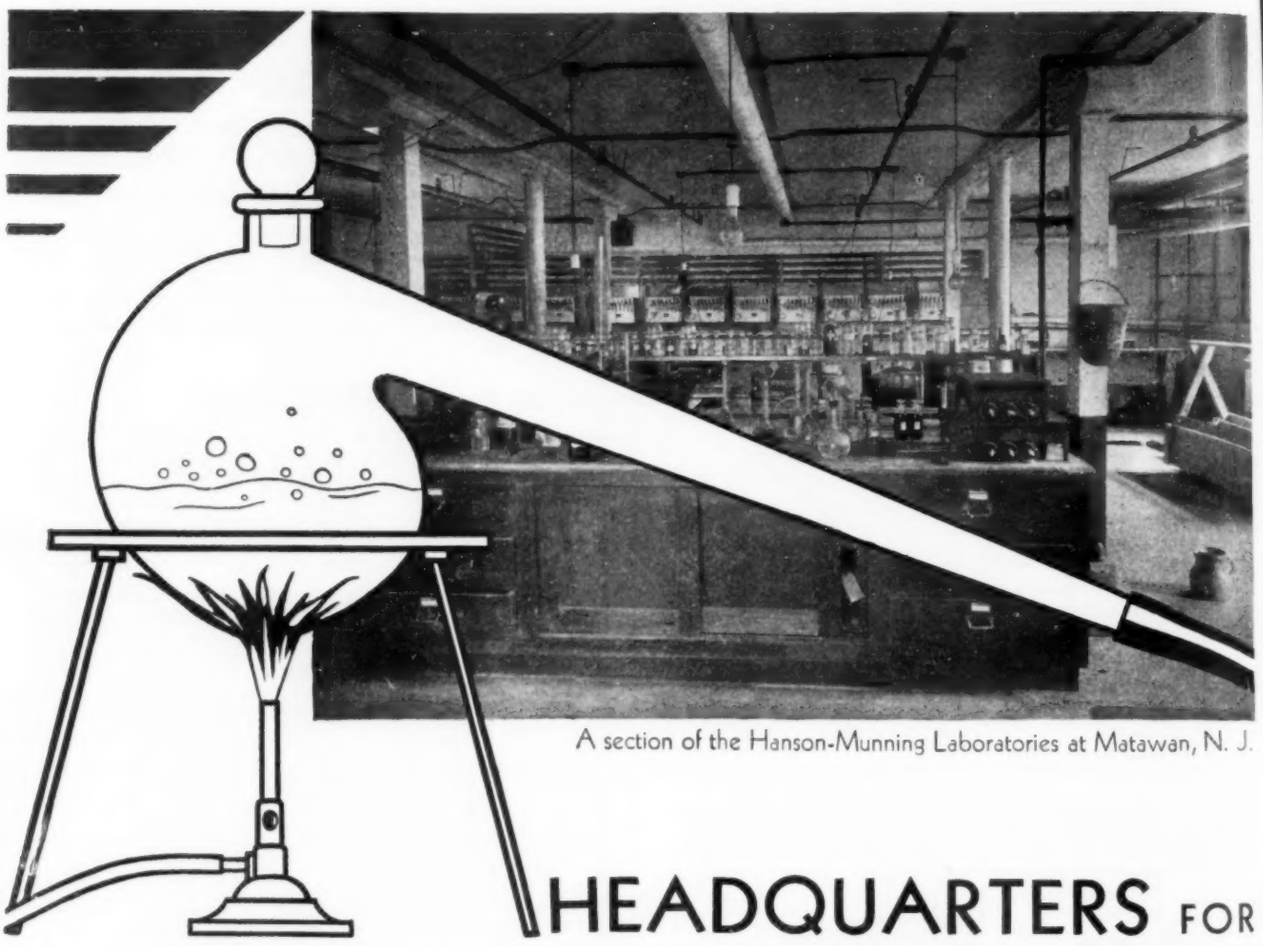
Extra filter sets are for different solutions that need filtering often. Otherwise filter set in machine can be washed off and used on either nickel, cyanide, cadmium or chrome solutions.

MACHINES ARE EQUIPPED AS FOLLOWS: No. 1 suction hose, 10" long, No. 2 & 3 self primer and large line strainer, No. 4 well built centrifugal pump, with impeller that clears gritty liquids, No. 5 & 6 valves to filter and free hose, No. 7 seamless steel tank, coated or lined if to be used on nickel solution, No. 8 filters set perpendicular and sludge drops off freely when washing, No. 9 discharge hose for filter and free valve 20" total, No. 10 & 11 super-service cord and starting switch, No. 12 well built truck 24" wide that fits in narrow aisles, No. 13 complete filter set is attached to a cover, No. 14 & 15 pipe frames and heavy mesh supporting filter bags, lead coated if for chrome or nickel solutions, No. 16 filter cloths last for a long time and cost very little to replace.

We now have over 200 Portable machines in plating plants. Names of firms, in your vicinity, having our equipment, furnished on request. In States surrounding Connecticut or close to Chicago, we will make demonstration of full size machine if desired.

INDUSTRIAL FILTER & PUMP MFG. CO., Not Inc.

359-361 W. ONTARIO ST. CHICAGO, ILL.



A section of the Hanson-Munning Laboratories at Matawan, N. J.

HEADQUARTERS FOR PRACTICAL POLISHING AND PLATING INFORMATION

Books may teach; technical articles may suggest; but the real answer to your polishing or plating problem has probably never appeared in print.

It is individual. With the facilities at our command, we undertake to study and solve your individual polishing or plating problem —whether it be to eliminate a single troublesome difficulty or to modernize your entire department. If you want to reduce costs, improve the finish of your product, produce more in less space, or reduce the number of rejects—in fact, when you have any doubts about your polishing or plating efficiency—just consider HANSON-MUNNING as your headquarters for practical information.

HANSON-MUNNING PRODUCTS

Polishing machines, Lathes, Plating Equipment, Generators, Barrels, Tanks, Wheels, Abrasives, Buffs, Brushes, Compositions, Cleaners, Anodes and Salts

HANSON MUNNING

Leading manufacturers of polishing and plating equipment and supplies

Hanson-Van Winkle-Munning Co., Matawan, N. J., and Chicago

2081

For 35 years Acme White has been the standard buffing composition ror producing the highest lustre on nickel, copper, brass and other metals. It is the one lime composition that never varies in quality nor in performance. It is the final magic touch that has produced public acceptance for thousands of nationally known plated products.

HANSON-MUNNING PRODUCTS
Polishing machines, Lathes, Plating Equipment, Generators, Barrels, Tanks, Wheels, Abrasives, Buffs, Brushes, Compositions, Cleaners, Anodes and Salts

HANSON MUNNING

Leading manufacturers of polishing and plating equipment and supplies

Hanson-Van Winkle-Munning Co., Matawan, N. J., and Chicago

OST 3068